The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. V. | NOVEMBER 19, 1921 | NO. 127

Contents

NOTICES :—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

The prepaid subscription to "The Chemical Age" is 21s. per annum for the United Kingdom, and 26s. abroad. Cheques, P.O.O.'s, and Postal Orders should be made payable to Benn Brothers, Ltd.

Editorial & General Offices—8, Bouverie Street, London, E.C.4.
Telegrams: "Allangas, Fleet, London." Telephone: City 9852 (4 lines).

An Apologia

MR. WOOLCOCK'S review of the operation of the Safeguarding of Industries Act in the *Times Trade Supplement* is an excellent piece of exposition. It is useful even to the opponent of the measure, for it explains its operative machinery and states the argument for its aims better than anything previously published. It is a service the Government will probably be grateful for, especially those members of it who, out of a rather limited knowledge and understanding of the case, have to meet persistent criticism in Parliament. Mr. Woolcock writes on the subject as one who really knows it. Though he played a particularly active and capable part in getting both the Dyestuffs Act and the Safeguarding of Industries Act safely through the difficulties which threatened them, and is still, we imagine, a thorough believer in both, he reviews the position now with a judicial detachment of mind and indifference to party considerations. He gives some privileged glimpses into the legal and departmental problems which are already agitating the official mind, and the moderation of his claims almost disarms criticism.

Dealing with Part I., Mr. Woolcock classifies the objecting parties into two—merchants "whose business is to sell foreign goods," and manufacturers who find that the finished product of one maker is the raw material of another. It might be objected that the definition of the merchant here rather begs the question. Selling foreign goods is only one section of the merchant's vocation; he sells a pretty substantial volume of British and Colonial goods, too. He is the promoter of British trade, and if restrictive legislation in the one direction cuts off his positive activities in the other the national loss may vastly exceed the gain. Two typical instances of the Act's effects are given. Santonine, included as a fine chemical, is made in Turkestan from a native herb, and Mr. Woolcock admits it is not likely to be made in this country. In that case the consumer pays more without the slightest benefit to any British industry. As regards camphor, again, natural camphor is a Japanese monopoly, but the Germans produce camphor synthetically, and, on the speculative ground that some day we may manufacture synthetic camphor also, the article is taxed. No British camphor industry is protected, for there is none to protect, but other industries—manufacturers of cellulose, for example, who use camphor in their process—are penalised by having to pay more for their raw material; a good example of the complicated way in which fiscal remedies work.

Mr. Woolcock improves upon the official definition of a fine chemical by describing it as "one which (1) is usually made in small quantities relatively to heavy chemicals or/and (2) is of an exceptional degree of purity or otherwise of special quality, and (3) requires skilled supervision in its manufacture." The last he regards as the most important. The manufacture of the scheduled chemicals is a key industry, not solely or even mainly because of the essential character of the substances, but because, without the scientifically trained staff and workers which their manufacture requires, this country would be at a fatal disadvantage in commerce and war. The argument for the Act thus becomes ultimately almost as refined in its texture as any fine chemical itself, and leaves one wondering a little if the Government have taken the cheapest and most direct method of securing what they had in view. As regards Part II., Mr. Woolcock frankly recognises the extent to which the purposes of the Act may be defeated by inequalities in exchange

values, and his final conclusion could hardly have been made more modest without abandoning the case altogether—" For these reasons it is much too soon to say that the Act is of no use to anyone."

The Complete Chemical Engineer

THE views which Professor Hinchley expresses in our columns to-day as to the purpose and policy of the Institution of Chemical Engineers which is about to be established will, we think, be generally endorsed. In any case, they help towards a clearer conception of what is really needed. The Institution, in the first place, will not be a teaching body; nor is it likely to be even an examining body. It may, however, in due course, come to exercise the functions and authority of a qualifying body. Its first duty, it seems to us, will be to define the knowledge, training, experience, and qualities which should entitle anyone to describe himself as a chemical engineer. Having set up a standard—and it would be well from the outset to set it high—the Institution will next have to organise courses or schemes of training, both academic and practical, to enable the student to acquire the prescribed qualifications. Such facilities for training it cannot supply itself; it can only supply them through the existing educational institutions, from the universities downwards, and that may be a matter of long and troublesome negotiation. Still, it is the only way, and future disappointment may be avoided if it is recognised at once that the Institution is only now beginning a task which may require years for its completion.

The essential thing for the present is to lay sound foundations which will not have to be torn up later and reconstructed. Essentially the movement is educational, and the complete educational machinery for carrying it through will have to be gradually built up out of the detached parts to be found in our existing centres of scientific and technological training. The educational authorities of the country are, to the extent of their funds, only too ready as a rule to co-operate in schemes for fitting their teaching more perfectly to the needs of national industries, and the Institution will have done a great work for chemical industry when it has established throughout all our recognised teaching and training centres a common standard of attainment and, within limits, common courses of study. All this, as we have said, will require time and patient organisation, but it can be achieved if the work is steadily prosecuted.

It would be illusory to suppose that any organisation can suddenly bring into existence a new race of perfect chemical engineers. Even supposing that all the requisite educational facilities were available now, it would take some years for the first batch of raw students to develop into the finished article. The preparation, involving a mastery of the principles of the two allied sciences of chemistry and engineering, to be followed by a corresponding mastery of the practice and application of both, will necessarily be longer and more arduous than that which either the chemist or the engineer now undergoes. The essential condition, as the name implies, is a dual and complementary qualification. The Institution, therefore, in attempting to bring a new class of practical scientists and technologists into existence, is entering upon a really great work. Some years must pass before the first fruits appear. But if the Institution looks far enough ahead and follows high aims and sound methods, it may hope for a time when membership of a British Institution of Chemical Engineers will be a recognised guarantee of a standard of qualification equal to the best in the world.

A New Economic Factor

THE remarkable development of the application of catalysis in chemical industry has, perhaps, been the outstanding feature of the last decade. The large scale introduction of catalysts has resulted in the speeding-up of reactions, which means increased production in a given time, while the possibility is opened up of utilising cheaper raw materials. Professor Bancroft of Cornell University places considerable faith in the fact that the speedy return to general prosperity lies in the intensive development of chemistry, and he states that the most promising way of effecting this is by a better utilisation of catalytic action, which, incidentally, he styles a new economic factor. The possibilities of this new factor are, of course, illimitable. It may be said that the organic chemist is only just beginning to use catalytic agents with zest, and we may expect at any time to hear of improved methods of manufacture, such as the recent synthesis of maleic acid from benzene. Again, with the problem of the future supply of fuel, some believe that the solution lies in the hydrogenation of coal. Others think that a better yield of alcohol by fermentation will provide the solution, while still others hope to prepare a combustible liquid from tropical vegetation and cornstalks. At present it is not possible to say which, if any, of these methods will come into prominence, or whether other processes will enter into the question. All that have been suggested, however, require the use of catalytic agents.

Undoubtedly, one of the most interesting possibilities is that opened up by Sabatier in connection with the use of catalysts in the production of organic compounds. Thomson in England proved that catalytic agents may displace equilibrium, contrary to what has been believed by Ostwald and his school in Germany. Reid of the Johns Hopkins University has apparently furnished the missing experimental proof. He passed a mixture of the vapours of ethyl alcohol and acetic acid for twenty-four hours over silica gel as a catalytic agent and during the whole of that time he obtained about 10 per cent. more of ethyl acetate than corresponds to the theoretical equilibrium. These experiments have not yet been repeated by anybody else, and there is always the possibility of an unsuspected error. Assuming, however, that they are possible, Professor Bancroft says that of course nobody cares about an increased yield of ethyl acetates, but one has to think—to take a single example—what a displacement of 10 per cent. in the right direction would mean in the synthesis of ammonia. Such a thing may not be possible, but it looks as though this is a legitimate scientific dream, and the legitimate scientific dreams of to-day are often the successful technical processes of to-morrow.

Defining a "Chemist"

THE Pharmacy Acts Amendment Bill, which is backed by Captain O'Grady, Colonel Watts Morgan, and Mr. Casey, creates in its first clause important restrictions on the use of the word "chemist." On and after January 1, 1925, no person shall be enabled to use the title unless he is a chemist within the meaning of the Act and is so registered. Any person, however, now entitled to describe himself as a chemist and druggist, or druggist, or pharmacist, or dispensing chemist or druggist shall still be entitled to use so much of such title as does not include the word "chemist." On and after the same date the Institute of Chemistry shall alone possess the power to authorise any person to use the title "chemist," and to this end shall conduct examinations. Any person who, as the result of such examinations, obtains a certificate of competent skill, knowledge, and qualification shall be entitled to register as a chemist under the Act. Similarly the Pharmacy Society is given powers to conduct examinations, and to place persons on the pharmaceutical register. For the purposes of the Act it is proposed to constitute a central council consisting of sixteen members. Four of these are to be appointed by the British Medical Association, four by the Incorporated Society of the Institute of Chemistry, four by the Pharmaceutical Society, and four by the Incorporated Society of Pharmacy and Drug Store Proprietors of Great Britain, Ltd., with a chairman to be appointed by and to be a member of the Privy Council. With regard to the sale of poisons the Bill makes it unlawful for a manufacturing or wholesale chemist to supply any poison or poisonous matter except to a person who has been registered and whose name is on the pharmaceutical register, and no person shall carry on business as a wholesale or manufacturing chemist who is not, or does not employ at least one person who is, on the pharmaceutical register. These are, broadly, the provisions of the Bill, which seeks to set up definite standards of professional qualification, but which, as a private measure, may be long in reaching the Statute Book.

International Courtesies

THE messages which have just passed between the Chemical Industry Club of London and the Chemists' Club of New York are a pleasant example of international courtesies which may unconsciously, though none the less really, help to protect both nations from political misunderstandings. It is now more important than ever that Great Britain and the United States should be on close and intimate terms of friendship, and exchanges of greetings and personal visits are one means of securing this by making both nations realise how much they have in common. Science and scholarship are interests that, in any event, cannot long be imprisoned within national or racial boundaries, and as both the messages in this case recognise, the pursuit of research and the application of its results to the service of mankind are objects that inevitably unite men of science the world over. The two clubs by an interchange of the privileges of membership have already done something to make one community of their members, and their example may be commended to all bodies in a position to exert a similar uniting influence.

Points from Our News Pages

Books Received

THE EMISSION OF ELECTRICITY FROM HOT BODIES. By O. W. Richardson. Second Edition. London: Longmans, Green, & Co. Pp. 320. 16s. net.

ELEMENTARY CHEMICAL MICROSCOPY. By Emile Monnin Chamdt. Second edition. London: Chapman & Hall. Pp. 479. 25s. net.

A TEXTBOOK OF INORGANIC CHEMISTRY. By A. F. Holleman. London: Chapman & Hall. Pp. 527. 19s. net.

The Calendar

Nov.		
21	Chemical Industry Club: "The Future Prospects of Palm Oil." Mr. Paul Tingey. 8 p.m.	2, Whitehall Court, London.
22	Institution of Electrical Engineers: "The Claude Synthetic Ammonia Process and Plant." J. H. West.	London.
22	Sheffield Association of Metallurgists and Metallurgical Chemists: "Basic Open Hearth Practice." J. N. Kilby.	Sheffield.
23	Society of Chemical Industry (Newcastle-on-Tyne Section): "Chemical Works Organisation." W. B. Davidson.	Armstrong College, Newcastle-on-Tyne
23	The Industrial League and Council: "The Industrial Revolution in England." Mr. H. E. Blain. 7.30 p.m.	Caxton Hall, Caxton Street, Westminster, London.
25	Society of Dyers and Colourists (Yorkshire Section): "Chemical Engineering in the Textile Trades."	Halifax.
25	University of London: "Nutrition." Dr. J. C. Drummond. 4.30 p.m.	South Kensington, London.

Prepared Foods and Vitamins

A few weeks ago we published an article relating to the vitamin content of some of the artificial foods which form such a staple item of the diet of the working population. The writer describes below the methods which have been applied with promising results to the preservation of vitamins in other food substances.

ONE of the most important and interesting of the questions in the newer science of nutrition and the *rôle* of vitamins therein is that concerned with the preservation of the essential properties of these vitamins or accessory factors in prepared or preserved foods, *i.e.*, foods which have been subjected to some form of artificial treatment, especially heating. Since such artificially treated foods predominate in the diet of the present age, and if the new vitamin doctrine is

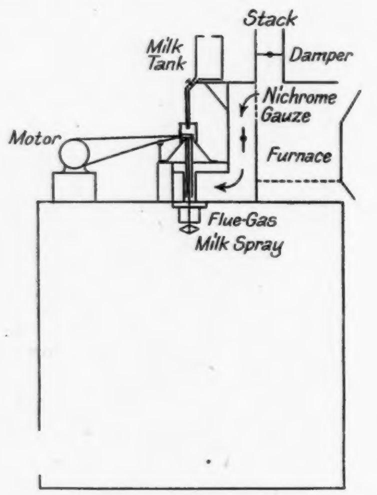


FIG. 1.

really sound and unexaggerated, it is of fundamental importance to determine the effect of heat, &c., on the three different classes of vitamin, A, B, and C.

One of the most valuable foods of man, and one containing a plentiful supply of vitamins, is milk, and a great deal of work has been done in this country and America to determine exactly what happens when milk is heated for sterilisation and pasteurisation purposes. In France, too, the Pasteur Institute has carried out research work in the same field, and L'Ecole de Puériculture de la Faculté de Médicine, in Paris, has just published some results of similar work. The main problem has been to obtain a thoroughly sterilised milk and at the same time retain the lecithin and the vitamins intact. Prior to these investigations of the French Medical Faculty Dr. Stassano, of the Pasteur Institute, had devised a laboratory method of sterilising milk by exposing it, in extremely thin layers (1/100 mm.), for fifteen seconds to a temperature of 130° C. It is claimed that the milk thus treated possesses all the qualities of raw whole milk. A similar method was used at the medical school, wherein the milk, in a thin annular form, was heated to 138°-140° C. It is stated that this milk was fed to children suffering from malnutrition, with excellent results, and it is thence concluded that the vitaminous properties of the milk have been fully preserved. Further feeding experiments to confirm this seem, however, very desirable. A large scale process on these lines is being evolved by the Ecole de Puériculture.

In America some valuable work has been done in the Laboratory of Physiological Chemistry, Minnesota University, where F. J. McClendon has devised an apparatus for reducing milk and fruit juices to powder without destroying the vitamins, and also methods for obtaining concentrated extracts of vitamins A, B, and C. These extracts are really mixtures of vitamins with one particular class of vitamin predominating. Briefly, the method is as follows: Vitamin A is first extracted from green leaves or fruit skins under high pressure, after moistening with alcohol; next follows the separation of the resinous and lipoid material from the water-soluble portion in extracting vitamin B by increasing the hydrogen ion concentration up to the isoelectric point of these colloids; and then finally the removal of the sugars from the B and C extracts by fermentation with baker's yeast. All this is done in the absence of oxygen.

In making the A extract the green leaves or fruit skins are dried, in the absence of oxygen, ground to a powder, moistened with 95 per cent. alcohol (boiling) and allowed to stand for twenty-four hours, after which it is subjected to a pressure of 5,000 lb. per sq. in. The juice is dried in the apparatus, hereafter described, but if it is desired to recover the solvent, preliminary concentration *in vacuo* is done. The resulting product contains resinous or fatty substances, and may be a sticky powder when perfectly dry, but is hygroscopic.

The water-soluble B extract is made from wheat germ or other foodstuff, such as yeast, rich in vitamin. Similar methods to those used for A are employed, except that alcohol of 80 per cent. strength is used. The press cake is ground in a mill and extracted again, and the juices are concentrated in the vacuum pan to about one-tenth of original volume. An equal amount of water is now added, also hydrochloric acid is slowly stirred in until a bulky and sticky precipitate is formed. This is filtered off, the precipitate washed with distilled water, the washings added to the filtrate, and the precipitate dried and extracted with benzene. The filtrate is brought to pH equals 4 to 5, fermented until the reducing sugar is lowered to about 1 per cent. of its original value, the yeast filtered off and added to the next batch, and the filtrate evaporated to dryness. In both the filtrate and the benzene extract the w.s. B is in concentrated form, and there is very little loss.

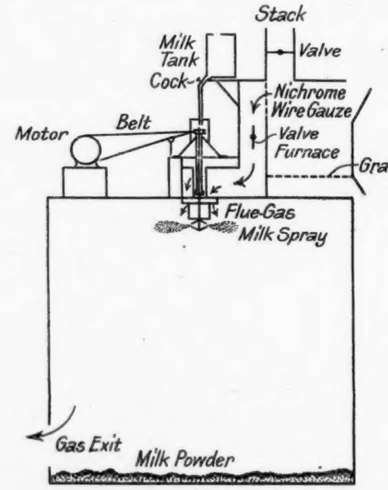


FIG. 2.

The w.s. C (water-soluble C) is extracted from fruits, including tomatoes. Oranges, for example, are pressed, the juice run into vessels containing carbon dioxide, to exclude air, baker's yeast added, and the vessel covered to exclude air. Fermentation proceeds at room temperature for twenty-four to forty-eight hours until the sugar content is reduced to

about 1 per cent. The juice is then filtered and condensed by spraying in the apparatus hereafter described until the volume is reduced to about one-twentieth. It is then thrown into four volumes or more of 95 per cent. alcohol, the precipitate filtered off, and the filtrate dried by spraying.

In recent issues of the *Journal of Biological Chemistry* details are given of animal feeding tests, using these extracts, from which it is concluded that: (1) Extract A contains sufficient fat-soluble (f.s.) A so that 0.05 to 0.1 gm. daily added to a ration otherwise free from f.s. A will produce normal growth in a rat. It also contains a considerable proportion of w.s. B. (2) Extract B is rich in w.s. B, so that a very small dose of either the lipoid or w.s. fraction will cure polyneuritis in a pigeon, and both fractions are effective growth stimulants. (3) Extract C contains sufficient anti-scorbutic vitamin, so that a very small dose will prevent scurvy in a guinea pig on a basic diet supposedly free from w.s. C for a period of about two months.

The drying apparatus (Figs. 1 and 2) finally adopted consists of a chamber 8 ft. square and 12 ft. high, at the bottom of which is a flue gas exhaust about 6 in. in diameter, and in the centre of the ceiling or top is a flue gas and spray intake.

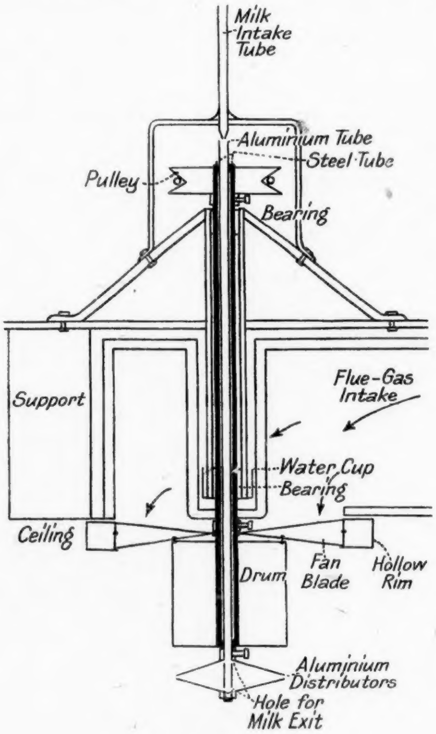


FIG. 3.

The aluminium spray or distributor 3 in. in diameter is rotated on the same shaft with the fan (6 in. in diameter), propelling the flue gas, at a speed of 5,000 r.p.m. by a small electric motor of $\frac{1}{4}$ H.P. If ball bearings are used the size of the motor can be reduced. The furnace is built on the top of the chamber, and is constructed of fire-brick plastered with fire-clay, and has two flues with valves, one extending upward, and the other closed by nichrome wire gauze and passing downwards through an opening in the centre of the ceiling of the chamber. The mechanism (Fig. 2) propelling the flue gas revolves on a steel tube, inside of which is a brass or aluminium tube touching the steel tube only at the extreme top and bottom, thus leaving an insulating air space between the two tubes. Above the aluminium tube is fixed a nozzle which spurts a stream of milk into the aluminium tube. The milk passes from the feed tank through a regulating valve into the inner tube and out through a series of holes near the bottom where it strikes the surface of two cone-shaped aluminium distributors, being thrown off from the toothed periphery. On the steel tube, just above the aluminium distributors, is a hollow drum which serves to prevent eddy currents and retard passage of heat to the steel tube; and above this drum is a fan with a hollow rim which forces the flue gas downwards, cutting the spray at right angles, and rapidly evaporating the water. Undue heating of bearings is prevented by air spaces and water-grooves. Further details are given in the *Journal of Biological Chemistry* (July, 1921), and some of the diagrams are reproduced herewith.

Reviews

MODERN GASWORKS PRACTICE (Second Edition). By ALWYNE MEADE. London: Benn Brothers, Ltd. Pp. 815. 55s.

The production of gas for domestic and industrial uses is a comparatively modern industry, and although its development has been very rapid it is the opinion of those best qualified to judge that its future growth will be at a greatly accelerated pace. Thirty or forty years ago the student of gas engineering and gas manufacture was ill-supplied with books of reference. He had to rely on Clegg's "Treatise on Gas Manufacture," a similar and better-known work by King, and on Newbigging's handbook. The first two volumes have now merely an historical value; in fact, until Mr. Meade published his first edition of "Modern Gasworks Practice" in 1916 there was no first-class book of reference on the subject. That Mr. Meade was particularly well qualified for his great task cannot be doubted. He has always been a student, and this, coupled with his practice as the engineer of a large gas works, his work as a lecturer on the subject at the London Polytechnic and at the Westminster Technical Institute, and the knowledge which made him Miller Prizeman in 1910-11, and Telford Premiumist (1918) of the Institution of Civil Engineers, has enabled him to produce a work which many gas engineers will thank him for and every student of the subject will strive to purchase.

A perusal of the volume leaves one with the impression of its completeness, its "up-to-dateness." The disabilities and difficulties from which the gas industry suffered during and for some time after the war were blessings in disguise, for they put gas engineers on their mettle, and, owing to the removal of many burdensome statutory restrictions, they were able to experiment; in fact, since 1914 great strides have been made in the economical production of gas from coal. It was, therefore, necessary that Mr. Meade should revise his first edition. He has done this so completely that one can quite appreciate that the preparation of the second edition has, if anything, been more exacting than the compilation of the first. He should be rewarded by the assurance that the only possible competitor with the second edition is the first. The former is nearly double the size of the latter, and correspondingly more valuable.

Considerations of space prevent one from giving much detailed comparison of the two editions. The chapter dealing with "The Planning and Laying-out of Gasworks" is most interesting and valuable. Following the description of the general Acts governing the industry and a *précis* of the Gas Regulation Act, 1920—which is rightly described as "epoch-making"—the author gives advice as to the "Choice of a Site," "Area of Land," "Capital Required," "Rules for Size of Plant, &c.," and a detailed estimate of the cost of a complete 500,000,000 cub. ft. works. As, however, the costs in this estimate are based on the conditions existing prior to recent standards of prices, its chief value is in showing how the total expenditure is apportioned. The chapter on "Foundations" will be found most useful, but would be

improved by reference to the Simplex pile, which is probably the best form of pile for use on gasworks where the ground is difficult. All of the original eighteen chapters have been more or less re-written and brought up to date, and there are three new ones entitled "The Measurement of High Temperatures in Gasworks," "Naphthalene in Coal Gas," and "The Complete Gasification of Coal." The chapter on the last-named subject gives the most complete statement which has yet been written on this important question, and provides a broad basis for discussion among the advocates of horizontal and vertical retorts, plant for complete gasification, and also plant for the production of blue water gas. As regards the last, the table on p. 763 gives the cost per therm of blue water gas as greater than that of the other gases enumerated. If, however, the collateral advantages of its production are considered, *e.g.*, the enhanced price obtained for coke owing to the smaller quantity produced for sale, saving in capital outlay and in plant repairs, the cost per therm will be much reduced. After reading this splendid work, Goldsmith's lines:

"And still the wonder grew,
That one small head could carry all he knew,"

come to one's mind, but Mr. Meade has acknowledged the help he has received from others, and it is this help, coupled with his own wide knowledge and literary ability, which has enabled him to produce a great standard work.

DOUGLAS H. HELPS.

MINING PHYSICS AND CHEMISTRY. By J. W. WHITAKER, B.Sc. (Lond.), A.I.C. (Tech.). With an Introduction by PROFESSOR W. H. McMILLAN, B.Sc., M.I.M.E. London: Edward Arnold & Co. Pp. 268. 9s.

This book, as the author tells us in the preface, is one in which "there has been no attempt to deal with the more advanced portions of the subject-matter, the book being of an introductory nature." In reality, it is a text-book of the elements of physics and of chemistry, consisting of 260 pages, ninety of which are devoted to physics and the remainder to chemistry. As opportunity occurs, the applications to mining of the principles of these branches of science are discussed and explained—*e.g.*, water gauges, pumps, siphons, barometers and methods of measuring the pressure of gases, hygrometry and photometry, &c.

In the section dealing with chemistry, the gases of the atmosphere and the mine gases, "damps," are specially treated; the physiological properties of carbon monoxide, its detection and estimation, are described. Combustion, respiration, and explosion have a special chapter in this section devoted to the discussion of these phenomena; the safety lamp, its construction and use, are dealt with in Part I., under Physics. There is a useful chapter on explosives, and coal forms the subject of the last chapter, in which twenty-four pages are devoted to a sketch of this subject, dealing with the origin, analysis and classification of coal, its proximate analysis and the various processes used in the distillation of coal and the nature of the products formed in these operations.

It may be acknowledged that the author has succeeded in producing an account of the elements of physics and chemistry suitable as a class book for students in mining; but despite the fact that the matters dealt with are of special interest to miners, still there is little justification for the title "Mining Physics and Chemistry." Such a description might possibly mislead the layman to imagine that a new physics and a new chemistry had been evolved, whereas he would discover that the volume deals with the elements of these sciences and some applications to mining. In a book of this kind graphic formulæ are surely out of place, as neither time nor space allows for explanations, without which the information conveyed by such formulæ must be altogether illusory. Some account of electricity may be reasonably expected in a book treating of "Mining Physics," and finally, is it not unusual to write "an hydrometer"? Still, the book may prove serviceable as a text-book for mining students. B.

The White Lead Controversy

(FROM A CORRESPONDENT)

IT is certainly unfortunate for the International Labour Conference that it should in these early and critical days of its existence have taken up so thorny a subject as the question of the use of white lead. No subject has been the cause of more acrimonious debate. Even the dispassionate calm of the scientific societies has been disturbed by violent disputes as to the validity of evidence as argument for or against its prohibition. The argument, in fact, involves almost every branch of modern industry. The chemist and the doctor are involved in the solution of the many problems that arise in the study of the cause and prevention of industrial disease, and in the present case the problems have been of peculiar difficulty. It must be admitted that scientists in both the chemical and medical professions have had to admit that they have been misled into too definite assertions on what has subsequently proved to be insufficient and sometimes inaccurate data.

From the scientist's point of view, the main points have been in connection with the exact process by which the lead enters the system, and the symptoms by which its poisonous effects are revealed to the medical man. Neither problem is easy of solution. It seems to be conclusively proved, however, that the particular danger in dealing with white lead lies in the formation of dust. The precautions which have been based on this assumption have reduced the risks of white lead poisoning to almost negligible proportions in the factories which come under the Home Office supervision. The difficulty of safeguarding men, such as painters, the nature of whose work renders supervision such as is maintained in a factory impossible, still remains.

Granted that the "dust" theory is correct, actual painting with white lead paint should be quite as safe as dealing with any other paint, but the operation of "rubbing down," which produces dust in great quantity, still remains a source of great danger. It can, of course, be suggested that the wearing of masks be made compulsory, but unfortunately familiarity breeds contempt, and it is a fact that it is practically impossible to make the average working-man take the precautions for his own safety. If anyone should doubt this, let him try to persuade a city window-cleaner to hook his belt on while working outside the top-storey window.

It was until comparatively recently held that the fumes given off by white lead paint in drying were poisonous, and a famous scientist announced that lead in minute traces was present in the fumes. Further research, however, failed to substantiate this, and the fumes can be regarded as safe so far as lead poisoning is concerned. It was, however, shown that the fumes or vapours from turpentine were responsible for painters' colic, and that symptoms were developed which so closely resembled those of lead poisoning that the medical authorities confessed that mistakes were not only possible, but probable. From the question of scientific evidence alone there arises much cause for debate, and naturally the interested parties have not been slow to avail themselves of the divisions in the camp of the scientists.

The practical considerations are also somewhat involved. White lead has for centuries been the premier white pigment. Until quite recently it has been almost without competitors, and certainly had no rivals. The introduction of zinc oxide, however, has altered that. It is claimed by those interested in its manufacture that it can fulfil all the functions of white lead, and, in addition, do other things as well. The British painter and the vast majority of paint technologists, however, are not so whole-hearted in their championship. They maintain that both white lead and zinc white have their peculiar excellences; that one will stand where the other will fail, and often a mixture of the two prove better than either alone.

Zinc white is remarkable for its hard brilliant whiteness. It is, in fact, the main constituent of white enamel; lead, on the other hand, though not so pure a white, has a wonderful covering power; weight for weight, it will cover far more surface than any other paint. It works with an ease that delights the heart of the painter, and the coat it forms has an elasticity which gives it wearing qualities that make it the outside paint *par excellence*.

The economic question is also a thorny one. White lead is largely made in England, and, though it is true that zinc white can be made here, the raw material would have to be

imported; consequently the white lead corroders not unnaturally argue that a campaign for the prohibition of white lead is a campaign against a British industry, and one in favour of a foreign pigment, the makers of which are quite alive to the advantages which would accrue to them from the abolition of the pigment which has so long been regarded as the one and only white pigment for good outside work.

Such is, in brief, an impartial account of the nature of the problem which the Geneva Conference has to tackle. As a preliminary, its office recently published a "questionnaire" which at once created great excitement among the supporters of the use of white lead. The questionnaire invited criticism with its first remark, "Seeing that there are new pigments which render the use of White Lead no longer unavoidable"—a definite statement which, as already pointed out, is open to debate in the view of the majority of English and American experts. The questionnaire also gave a summary, stated to be impartial, of the position of the controversy, which has been violently attacked on many grounds. The reputation of the Bureau is at stake, for once it can be proved guilty of being a tool in the hands of vested interests its authority ceases to exist, and its powers for good are reduced to negligible proportions.

Institution of Chemical Engineers

A Chat with Professor Hinchley

DISCUSSING with a representative of THE CHEMICAL AGE the decision arrived at last week to establish an Institution of Chemical Engineers, Professor J. W. Hinchley, of the Imperial College of Science and Technology, who has been one of the most active minds in the movement, explained a little more fully the aims of the Institution as he understands them.

"The first thing," he said, "which impressed everyone at last week's meeting was the entirely spontaneous spirit in which the matter was at once taken up. Usually in such affairs it is necessary for someone to give a lead at the outset. No lead was really necessary. Everyone seemed to realise the need which exists in this country, and to agree that the only method of meeting it was the establishment of an Institution of Chemical Engineers. Such an institution will be essentially a qualifying but not a teaching body, and if it does not actually institute its own examinations will be able in other ways to set up standards of examination and attainment for university and technological centres of training. That in itself would be an important work. At present the standards of many educational and training centres vary considerably. It would be a great advantage to have one standard of attainment generally recognised throughout the country and a common agreement on the best courses of study. The Institution may possibly be able to effect a unification of educational policy in this matter, and in that case membership of the Institution would be a definite guarantee that everyone admitted had gone through a specified course of training and had attained a recognised degree of efficiency in addition to having had experience in the industries.

"We want to ensure through the Institution more even than a thorough scientific and practical training and practical experience, though that, of course, is essential; we desire to ensure in addition an equally high standard of professional conduct. I need not explain the latter point in greater detail; your readers will quite appreciate what is meant. Through such an Institution as it is proposed to establish I see no reason why both these great objects should not in time be attained. Of course it will be necessary to take account of circumstances as they exist to-day. For example, there are numbers of experienced men who have done good work and have great practical knowledge who are too old to restart studies and sit for examinations. I think it would be very hard on such if their experience did not entitle them to some recognition. But, looking far ahead, we hope the time will come when the term 'chemical engineer' will signify something very much more definite than it indicates to-day.

"It is admitted," Professor Hinchley proceeded, "that the standards of chemical engineering in this country at present is low, but the possibilities open to chemical engineers of lowering the costs of production and increasing efficiencies are extraordinarily large. An engineer called on to install chemical plant to-day must be one who not only understands the fundamental principles of engineering but also the practice of them, and, in addition, understands the chemistry which enters into the properties, qualities, and uses of the materials he employs. On the other hand, the thoroughly up-to-date chemist must be thoroughly familiar with the latest developments of physical chemistry. He must understand the laws relating to gases, vapours, liquids, and solids, and their chemical and physical relationships. Neither, however, might be qualified to design a chemical plant capable of producing at a profit the required products on a commercial scale. You want in fact, a combination of all such qualities in one man.

"The number of first-class chemical engineers this country possesses is at the moment very small. No one can travel far without coming across examples of bad chemical engineering and plants which must have involved the owners in great expense before a satisfactory degree of efficiency was attained. That can only be put right in the future by a better and more thorough system of training. In my opinion, anyone going in for chemical engineering should first of all spend some years in the study of pure science, including such branches as mathematics, mechanics, physics, and chemistry. After taking his degree in science he should begin the study of chemical engineering, which should consist of all branches of engineering connected with chemical industry, including such additional subjects as filtration, distillation, evaporation, heat transmission, &c. There is a great deal of work to be done, but I see no reason why in time our chemical engineers should not be the equal of the best in the world."

"As regards the Chemical Engineering Group of the Society of Chemical Industry," Professor Hinchley said, "that has been simply an educational body. It may claim to have done some very valuable educational work, and in this field it will continue its efforts without in any way conflicting with the work of the Institution. Those of us who have been interested for some time in this problem are greatly encouraged by the success of the meeting last week, and we are hoping that the foundation is about to be laid of an organisation which in time will put chemical engineering in the high position it should occupy in a great commercial nation such as our own."

British Dyestuffs for Canada

SIR WILLIAM ALEXANDER, Chairman of the British Dyestuffs Corporation, who has just returned from a visit to Canada, in an interview at Montreal, strongly commended the use of British dyestuffs in Canada. "Canada," he stated, "will gain nationally and commercially by supporting the importation of the British manufactured dyestuffs. It is absolutely necessary to have the sympathy and support of Canada for the British dyestuffs industry. It is good insurance against price exploitation by Germany, and the dyestuff plant is adaptable for the production of munitions of war, and especially toxic poison gas, which, by the way, was first used on the Canadians at Ypres in 1915." Touching on the quantities of dyestuffs consumed by the different countries in the world, Sir William gave the total as 162,000 tons per annum. Of this amount Germany directly provided 135,000 tons. "Germany's post-war capacity is unknown," remarked Sir William, "but it must be enormously greater. The present capacity of countries other than Germany may be estimated at, United States, 32,000 tons; Great Britain, 25,000 tons; Switzerland, 12,000 tons; France, 8,000 tons; other countries, 4,000 tons. A total of 81,000 tons, exclusive of Germany. It is self-evident, therefore, assuming that the world's consumption within a reasonable number of years rises to 180,000 tons per annum and that Germany would not be called upon to deliver more than 100,000 tons, what is to be done with her surplus capacity? Is this not an important point for those dealing with the disarmament under articles 169 and 171 of the Treaty of Versailles?"

Sir William Alexander, who is managing director of Charles Tennant & Co., Glasgow, saw much service in France with his regiment, the Sixth Black Watch. He held many Government positions during the war, being Director of Administration of National Explosives Factories, Controller of Aircraft Supply and Production and Director General of Purchases and Supply Ministry of Munitions.

Nobel Chemistry Prize

As predicted in THE CHEMICAL AGE last week, it has been decided to award the Nobel Prize for Chemistry for 1920 to Professor W. Nernst, of Berlin University.

Germany Seven Years After

By C. H. Hughland

III.

You can get from the architecture of Berlin streets and suburbs a general idea of the recent history of the German people. The wealth of Germany can be dated during the last thirty to fifty years. Thirty or forty years ago German business men were beginning to make fortunes and to look for suburban retreats not too far from the centre of things. These they found in the Grünewald, which was then, I imagine, a flat piece of wooded country with two or three big lakes in it. Round and near these lakes they built houses standing in their own grounds, and roads were laid out to approach them. The houses of this date have seldom a distinctive German character, as have the houses built to-day. There are many with traces of the French style of the middle nineteenth century; some are frankly copies from the Swiss or the Russian, and one, now belonging to a big financier, Mendelsohn, which is an exact replica of an English Tudor manor house. This indicates—what was actually the fact—that the German architects were groping for a style of their own, and in this direction as in others they determined to be original.

German art, taking a hint perhaps from the Art Nouveau of the French, which in its turn had taken a hint from our æsthetic movement of the early 'eighties, launched out in all sorts of experimental directions, and the experiments, not always successful in design, were frequently shoddy in execution. Nor were they always new. There are rows of houses in the Charlottenburg district dating from about 1900 or 1901, elaborately decorated in stucco, an easy medium of expression, already falling into shabby patchiness, and doubtless doomed to take on a new face when the occasion offers. These show the French influence in a marked degree, but with differences that are typically German. And gradually one can trace the birth of a new style—very varied in its details, yet distinctly homogeneous.

In painting there appears concurrently with this a breaking away from the old academic or imitative methods, and the Secession school comes into being, with a loud note that grows gradually more harmonious and soothing. The architecture of the houses in the Tiegarten Strasse—something like our Park Lane—tells much the same story, and the buildings in the business streets, having always the idea of advertisement as an inspiration, show even more markedly a play of imaginative invention. The public buildings and monuments tell a story which is a blend of the private and the public note. The public buildings in a modern country, like Germany, are devised to reflect the country's glories. They are there to prove the existence of culture, refinement, wealth and worldly substance. They are, then, suitable to their purposes, whether they be government offices, museums, memorials, or churches, but they aim at a magnificence which is not utilitarian except in the indirect sense that they proclaim the nation's greatness. The Berlin Cathedral was built thirty years ago, and is very much what one would expect of a young and ambitious nation. It is showy and overdone; it is indeed far more like an opera house than a place of religious devotion. It is what a self-made man, as we in England know him, would have done, and Germany is essentially a self-made nation. But the succeeding generation has learned better. The newer buildings still sing the nation's song, with the loud pedal, and there is not much of the *vox humana* stop, but there is a strong individuality in which one sees, as it were, a reasoned art—art raised or reduced to a science. It is the art of a people that, knowing that art is valuable commercially, finds and trains artists, files and dockets their brains, and uses them at the psychological moment in the mathematically correct spot.

Now all this may seem to lie altogether apart from the known fact that Germany has been a military race, but there is, none the less, an intimate connexion. Visitors to Germany in the old days were aware of the existence of three distinct classes—the lower or labouring class; the middle or business class; and the upper or ruling class. All classes underwent military training, but only the upper class liked it. The members of it learned and loved soldiering from their boyhood, and they developed the love of it through their student days with their sabre duels, which contests, akin in some measure to our football and cricket matches, were the only athletic sports of these young men. "Show me a nation's sportsmen, and I will tell you what she is playing at." The soldier spirit went with them in their manhood, when they passed naturally as officers into the army. It was this military class above any of the others that wanted war. Science was, and is, in the blood, of the German, and in each of the two upper classes—those which received more than a primary education—science was the guiding spirit to one goal, though it approached it through different channels. The soldier worked scientifically for world power through war, and the business man worked equally scientifically for world power through commerce. The ruling class had the right to say the word when the chance came. The soldiers had their way, and they dragged the rest of the national structure with them. Yet to this downfall all classes went willingly at the beginning, for the soldier class was never definitely unpopular. Militarism, it must be remembered, gave Germany her start. Her modern prosperity can be traced to the war of 1870-71—a war skilfully engineered by Bismarck, who conceived, years before, the big idea of German world dominion. Playing with the Continental Powers as though they were the pieces in a chess problem, he brought matters to the pre-ordained climax when, with a suddenness that was soul-shattering and a precision that was physically irresistible, he inflicted a crushing defeat on the French, and with the same stroke united the disconnected and discordant German states into one great empire.

The commercial classes had, then, no cause to distrust the soldiers who apparently had achieved this result. The army, as it seemed to them, had brought them prosperity. It was not clear to the ordinary man that it was the scheming brain of Bismarck behind it all that had really done it. The army then, and later on the navy, became as it were an investment in which money could safely be sunk. It was encouraged and fostered like some expensive pet dog that might win a prize at a show or breed a highly profitable litter. Its bad manners were overlooked like those of a spoiled child. Its insolent young officers were tolerated and even admired, though they were the laughing stock of other nations. The rich business man gladly paid for it all because, when the moment was ripe, the history of 1871 might be repeated but with rewards immeasurably greater.

But all the while the power, the wealth, the real strength of Germany was clothed not in the pale blue uniforms of her soldiers, but in the black coats of her merchants. It was the merchants whom Bismarck saw as the justification of his visions. The army was a means to the end. And the merchants will lift Germany from the depths to which she has fallen to-day. There are two classes in Germany to-day. The military class has disappeared; hardly a military uniform is to be seen in the streets of Berlin or in the smart restaurants. Of the two remaining classes that of labour is taking a more prominent place, but the German workman has always been a worker and he is so still. He thinks socialism may possibly improve his lot, but he knows that work is the only philosopher's stone. In the merchant class the brains still live, and what they have done before they will do again, and they will do it the better for being unhampered by a huge and expensive army. Germany is down, but she is not out. She is, moreover, still writing her history in the buildings she is erecting. In Berlin there are many big sites cleared for new premises or with new ones in course of erection. Large portions of the principal streets are "up" for extensions of the tube railway, which is there very near the surface, and a matter of "cut and cover" instead of deep excavation as it is with us. Stuttgart is scrapping one enormous railway station for a fresh one on scientific lines. In the same town a technical college which would have been the pride and glory of an English town of the same size has been pulled down and supplanted by another far bigger and better equipped. In Leipzig they are erecting two huge halls for the use of exhibitors at the annual fairs, and it is realised, long before they are ready, that they will not be nearly large enough. At Munich—but the point need not be further elaborated.

Fitness for Life

On Thursday, November 10, Mr. Robert E. Meadows, of the Business Science Institute, lectured before the Benn Brothers' Social Circle on "Fitness for Life." Mr. Ernest Benn occupied the chair, and 120 members of the staff and friends were present. Mr. Meadows showed that modern business demanded a very high standard of physical and mental efficiency from those engaged in it, and suggested how the individual should make himself thoroughly fit for the position in life which he occupied. The lecture was followed by music given by members of the staff.

The World's Phosphate Supplies

The following particulars, supplementing those published last week, are taken from a volume on "Phosphates" (1913-1919) issued by the Imperial Mineral Resources Bureau.

In the year 1913 prices of phosphate had probably reached their lowest point, supply at that period having attained the maximum and having outstripped the demand. An adequate representation of the prices ruling is exceedingly difficult, owing to the consideration that sales of phosphate-rock are made on the basis of percentage content of tri-calcium phosphate. In most of the published statistics of value only the average price obtained is quoted.

In regard to land-pebble phosphate, for example, which varies from 66 to 79 per cent. tri-calcium phosphate, prices for the higher grade in 1919 were approximately \$6 per ton in excess of the prices ruling for the 66 per cent. grade. It will, therefore, be clear that the average price is no accurate guide to the market price obtaining for any particular grade, seeing that the average value would depend on the quantity of each grade mined during any particular period.

In the year 1913 the value of the standard 70 per cent. grade of land-pebble was approximately \$3.60 per ton, or, at the rate of exchange then ruling, 15s. per ton. By the end of 1919 this price had risen to \$7.35 per ton, or almost exactly double the price obtaining in 1913.

In the intervening period prices fluctuated considerably. At the outbreak of the war exports of land-pebble to foreign countries fell away rapidly, and prices barely maintained the 1913 level. Owing to the demands which the belligerent countries made upon America for agricultural produce, the exportable surplus of land-pebble was gradually absorbed, and prices tended to rise, but by 1917 the advance was only about \$1 per ton over the 1913 level. After the Armistice, famine conditions obtained in the phosphate market, and, consequently, prices rose very rapidly, but, all things considered, the advance in the value of phosphate was not so great as in the case of many other commodities.

It is thought that a brief reference to the course of prices of Tunis phosphate will, together with the above remarks as to land-pebble, form a sufficient indication of the effects of the war on the phosphate market.

With Tunisian phosphate, as with land-pebble, prices vary with the quality of the rock. The price of the most popular grade, 58 to 63 per cent., had reached its lowest point in 1911, and while there was very little actual difference between prices obtaining in 1911 and 1913, the tendency was for the price to rise. The 1913 value of this grade may be taken at about 15s. 6d. per ton, the 63 to 68 per cent. grade being approximately 22s. 6d. per ton.

In Tunis, as in America, the first effects of war conditions were to weaken prices slightly, but in this area labour was very rapidly withdrawn from the phosphate mines to fill the fighting ranks, and production fell so speedily that the value of the phosphate commenced to rise at a very much earlier date than in the United States.

By 1916 the price of the 58 to 63 per cent. grade had risen to 25s. per ton, with a proportionate increase in the price of the higher grade, and to the end of the war prices rose steadily, if slowly. Immediately after the Armistice there was a very heavy demand for Tunisian phosphate, but owing to the labour position there was very little improvement in the output during the year 1919. In consequence prices were very much inflated and quotations varied from 37s. to as much as 49s. 6d. per ton for the lower grade.

Prices of Egyptian phosphate rose to an even higher point than those of Tunis, but the Pacific Islands phosphate did not show such a marked advance in price, owing to the fact that the world's principal consumers are so far removed from the source of production, lack of shipping facilities restricting the demand to markets near at hand.

Manufacture of Superphosphates

The initiation of superphosphate manufacture from mineral phosphate-rock is ascribed to J. B. Lawes, an English agriculturist. It is believed that prior to his experiments a method of acidulating ground bones in order to obtain a form of soluble phosphate was practised, but it is generally admitted that Lawes was the first chemist to use mineral phosphates for the manufacture of superphosphate.

Lawes took out patents in England, in 1842, covering the acidulation of bones and phosphate-rock.

The first superphosphate is said to have been made from Cambridge coprolite by Lawes in 1845, and there can be no doubt that this discovery turned the attention of the world to the discovery of mineral phosphate deposits.

Amongst the earliest of these discoveries were the Somme deposits in France and the South Carolina and Florida deposits in the United States.

In the earliest processes of superphosphate manufacture, sulphuric acid was introduced into a lead-lined tank, the phosphate-rock being poured into the tank and stirred with hoes or rakes until reaction was complete, after which it was removed from the tank and spread out to dry.

The phosphate-rock was originally ground in a stone mill, and, in fact, stone mills are still used in many superphosphate factories; but in a large number of cases these mills have been replaced by ball mills or patent grinding mills of a similar nature.

The usual mixture in to-day's product is approximately 105 parts of sulphuric acid (115° Tw. or 66·53 per cent. H_2SO_4) with 100 parts of ground phosphate-rock. These are introduced together into a mixing chamber, where they are mechanically agitated until the reaction is complete. The loss in weight in manufacture is from 10 to 12½ per cent.

Experimental Work

There have been many attempts to discover a method of rendering the phosphate content of rock-phosphate soluble by other means than dissolving with acid, but so far no really satisfactory process has been evolved. Many experiments have been conducted with the object of—

(1) fortifying low-grade phosphates,
(2) freeing them from ferric oxide and alumina,
(3) increasing their solubility.

The chief patents taken out for this purpose are given by J. Fritsch in the "Manufacture of Chemical Manures" (London: Scott, Greenwood and Son), from which the following is abstracted by permission of the publishers:—

1. *Dumonceau and Nicolas* (French Patents Nos. 201,427 and 201,461) propose to fortify low-grade phosphates, consisting of phosphate of lime and carbonate of lime, by the use of sulphur. The principle of the two methods is as follows: Phosphatic chalk is calcined so as to produce a mixture of phosphate of lime and quicklime, which is mixed with water and sulphur in iron pans. The insoluble phosphate of lime is separated from the soluble sulphides formed. The strength is thus fortified 20 to 30 per cent.

2. *Simpson* replaces sulphur by sulphuretted hydrogen (German patent 58,925), and, after calcination of the raw phosphates, injects it into water, holding the phosphates in suspension.

3. *Brochon* (French patent 215,577) extracts phosphates rich in carbonate of lime by means of carbonic acid under pressure after crushing and stirring with water.

4. *Winsinger*, to prepare bi-calcium phosphate free from oxide of iron, completely soluble in citrate of ammonia (German patent No. 51,739), extracts all the phosphoric acid of the phosphate of lime by sulphuric acid, converts half the solution into mono-calcium phosphate, by the addition of carbonate of lime and milk of lime, which precipitate the iron; he adds this precipitate to the other half, and obtains by the addition of sodium sulphate, sodium carbonate and quicklime, phosphate of lime insoluble in water free from oxide of iron, which he finally adds to the solution of mono-calcium phosphate.

5. *O. Iahne* (German patent 57,295) prepares phosphate of lime free from oxide of iron, alumina, and silica, by acting on phosphates rich in oxide of iron and alumina with sodium bisulphate. The raw phosphates (coprolites, &c.), in this case carbonate and phosphate of lime, treated with an aqueous solution of sodium bisulphate, dissolve, whilst the silica, iron, and alumina compounds remain insoluble, and may be separated by filtration along with the gypsum.

6. In making superphosphates, *Martin* proposes to use the acid sulphate from the manufacture of nitric acid. The acid sulphate from the cylinders is dissolved in water, so as to produce a solution of 45° to 50° Baumé. The precipitat

consists of bisulphate, which it is easy to convert into sulphate by re-crystallisation, whilst the strongly acid solution is used to dissolve raw phosphates. All the phosphoric acid is dissolved, and the resultant superphosphates have less tendency to retrograde than those made with sulphuric acid of 50° to 53° Baumé.

7. *Thonnar and Huxton's* Belgian patent No. 96,109, and Rolland's Belgian patent 196,190, to eliminate the oxides of iron and alumina, may also be mentioned.

8. *Schucht* proposed to make superphosphates from ferruginous phosphate thus: As soluble ferric oxide induces retrogradation of the phosphoric acid in superphosphates, whilst the ferrous oxide is inactive, and as sulphate of ammonia possesses the property of forming with a ferrous salt double salts very stable in air, Schucht, on such data, proposed to dissolve phosphates in presence of sulphate of ammonia, then to effect the reduction and so obtain very stable superphosphates of ammonia. With this end in view, the finely ground superphosphates are mixed with sulphate of ammonia. One part Fe_2O_3 requires 1·75 parts of that salt to form the double salt $FeSO_4 + (NH_4)_2SO_4 + 6H_2O$. Reduction can only be effected by weak sulphurous acid which is injected under pressure into the diluted mixture of superphosphate heated to 80° to 100° C.

9. *Carr's* process, dealing with phosphates rich in oxides of iron and alumina, is analogous. It consists in calcining the phosphate, grinding it fine and then mixing 1,000 parts with 400 parts of sulphate of ammonia dissolved in 400 c.c. of hot water, to which is then added 800 parts of sulphuric acid of 53° Baumé. A violent reaction ensues, the mass intumesces and heats to 110° C. After an hour it solidifies and is easily ground; it contains 18 per cent. of phosphoric acid, two-thirds of which is soluble in water. [*Author's Note*.—It is evident that such generalisations are futile. The data given can only have been applicable to the particular phosphate to which Carr applied it. All phosphates rich in oxides of iron and alumina would not respond to such treatment so as to yield the above results.]

10. *Glaser* proposes to manufacture precipitated phosphates from insoluble phosphates of alumina, by treating the latter with a cold alkaline solution or with a hot concentrated solution of alkaline carbonate. In this operation the phosphate of alumina is dissolved. In using the alkaline solution, the liquid separated from the residues is treated with carbonic acid. If a hot solution of alkaline carbonate be used, it is cooled, and the dissolved phosphate of alumina is precipitated.

11. *Petermann*, of Gembloux, recommends treating the raw phosphate at a high temperature to convert the phosphoric acid into a very soluble form. Bazin has based a British patent No. 15,237 on this principle. He heats phosphates in retorts to a temperature of 1,300° to 1,500° C.

12. *Hodgkins* (American patent No. 423,320, 1890) mixes the phosphate in fine powder, with quicklime, which he then slakes. But it is not apparent how such treatment can render phosphates more soluble. Besides, no field experiments appear to have been made to test the value of the resultant manure.

Manufacture of Precipitated Phosphate by Electrolysis.—A new method of manufacture, based on electrolysis, has been invented by Professor W. Palmer, of Stockholm. It consists in converting the raw phosphate by the wet way into a readily assimilable form, at an ordinary or slightly elevated temperature. The raw material is ground apatite, which need not be finely ground. In an apparatus, specially constructed for the purpose, a solution of chlorate or perchlorate of soda is electrolysed; this disengages free chloric acid, sometimes even perchloric acid, in the "anode" cell. The acid "anode" liquid is made to react on the raw phosphate in a battery of wooden cases, fitted with perforated bottoms, so that the solvent first comes in contact with almost exhausted apatite. The alkaline liquid from the "cathode" is added to the saturated solution, in special precipitation vats, taking care to stir, until a slightly acid reaction ensues. There is thus formed a crystalline precipitate of acid phosphate of lime. It is freed as completely as possible from the mother liquor by filtration and washing, which is greatly facilitated by the physical nature of the phosphates. The yield is very satisfactory, because only about 1 per cent. of the phosphate in the raw material remains in the solution. The latter, which contains a third of the amount of lime originally eliminated from the apatite, is mixed with the residual alkaline cathode liquid, when the greater part of the lime is precipitated as hydrate; finally, a current of carbonic acid gas is injected. After precipitating the lime the solution is withdrawn and run into the electrolyser. The electrolyte is thus continuously regenerated. The product so obtained generally contains 36 to 38 per cent. of total phosphoric acid (the formula $CaHPO_4 + 2H_2O$ requiring 46·07 per cent. of P_2O_5). About 95 per cent. of the phosphoric acid in this product is soluble in Petermann's solution of ammoniacal citrate of ammonia.

Other alternative methods have all been along the lines of the investigations of Dr. Marloth, who mixed 100 parts of finely ground rock with 40 parts of ground limestone, 20 of common salt and 10 parts of dried sulphate of ammonia. The mixture was briquetted and calcined at red heat in a kiln, after which it was ground to pass a mesh of 100 to the linear inch.

A somewhat similar process was evolved in Italy, the resultant product being called "tetra-phosphate." The Italian process was developed commercially and used to a limited extent during the war period.

The advantage of manufacturing the mineral phosphate into superphosphate by admixture of sulphuric acid is that the phosphate of the rock is rendered soluble in water, and this makes it available for crops immediately it is applied to the soil. The extent to which the original phosphate content of the rock is rendered water-soluble depends upon the percentage of ferric oxide and alumina in the mineral used, hence for superphosphate manufacture a mineral which contains more than 4 per cent. of iron oxide and alumina is seldom, if ever, employed. The action of the metallic oxides in the process of dissolving is not very clearly understood, and it will suffice to say that they neutralise a percentage of the phosphate, which passes over into the finished superphosphate as not soluble in either water or a 2 per cent. solution of citric acid. Another injurious effect of iron oxide and alumina is that they tend to cause reversion from water-soluble to citrate-soluble in the finished superphosphate, due to the interaction of the mono-calcium phosphate and the tri-calcium phosphate, leading to the formation of di-calcium phosphate, or to the formation of ferric and aluminium phosphates by the action of the mono-calcium phosphate upon the iron and aluminium sulphates.

In the latter case sulphuric acid is again set free, and this in turn may possibly act upon some of the tri-calcium phosphate.

United Kingdom Phosphate Industry

Formerly phosphate-rock was obtained at many places in England, more particularly from the Cambridge Upper Greensand, where the productive bed consists of dark-brown or black nodules of phosphate of lime and is from 8 in. to 12 in. in thickness, and from a bed of phosphatic nodules 12 in. to 18 in. in thickness in Suffolk. Both these deposits produced a considerable output of rock, but the methods employed and the conditions under which mining operations were carried out rendered the cost of production rather high. Following upon the discovery and exploitation of the great American and African deposits of phosphate-rock, phosphate-mining in England ceased to be profitable, as the amount of iron present caused the phosphate to revert to the insoluble form, and very little phosphate-rock has been mined in England in recent years.

The output of superphosphate in the United Kingdom had gradually grown until at the opening of the war there were upwards of eighty factories engaged in the industry, the total output being approximately 800,000 tons. The development of the United States and African deposits of phosphate-rock, noted above, and the cessation of the working of the English deposits, rendered the United Kingdom manufacturers dependent upon foreign sources for their supply of raw phosphate-rock, consequently all the factories are to be found either at or in the vicinity of the principal ports. The geographical distribution of the phosphate works is such that the supplies of superphosphate do not have to be forwarded for any considerable distance. The principal centres of superphosphate manufacture are as follows:

England.—Mersey, London, Humber, Bristol Channel, Ipswich, Lynn, Plymouth, Newcastle.

Scotland.—Glasgow, Leith and district, Aberdeen.

Ireland.—Dublin, Belfast, Cork.

For the two first years of the war the superphosphate trade was left to obtain its own supplies of raw materials, and on account of the enormous demand for sulphuric acid for the manufacture of munitions it was found that there was a very considerable reduction in the superphosphate output.

To such a degree had the manufacture fallen that the production for the year 1917 was rather less than half that

of 1913, and this occurred at a time when strenuous efforts were being made to combat the submarine menace to our food supply by increasing by every means possible the production of food in the United Kingdom.

During the summer of 1917 the position had become very serious, and the Government decided to take over the whole of the superphosphate industry and to import and provide to the manufacturers of superphosphate the whole of the raw materials which they required.

Under an order issued in accordance with the Defence of the Realm Regulations the Minister of Munitions took over the whole of the stocks of phosphate-rock and superphosphate in the country. Arrangements were made for an adequate supply of acid to be provided for the manufacture of superphosphate, and shipping was also obtained for phosphate-rock. The result of these efforts is very plainly apparent in the figures of imports which are appended to this section.

The imports of phosphate in 1918 amounted to 464,872 tons, as against 276,617 tons in the year 1917. The superphosphate production in the year 1918 was approximately 800,000 tons, as compared with 460,000 tons in 1917. It has already been mentioned that the prices of raw phosphate up to the years 1917-18 had not risen very considerably, but, on the other hand, the submarine menace was then at its height and consequently the cost of bringing raw phosphate to this country had risen to a very alarming figure.

Although the shipping was, in fact, provided by the State, at the same time it was considered necessary to add to the actual cost of the freight a proportion of the very heavy expenses which fell on the State by reason of the frequent total loss of steamers and cargoes. It was not possible, however, for the whole of these expenses to be passed on to the price of superphosphate as this would have rendered the cost per ton of superphosphate to the farmer prohibitive and would thus have tended to discourage the use of fertilisers, which were essential for intensive food production. The State, therefore, fixed a reasonable price for superphosphate, and bore a proportion of the cost as a loss in the interest of agriculture.

During the year 1918 the demands on shipping for the moving of American troops to the theatre of war were such that for some two months it appeared as though it would not be possible to provide sufficient ships for the transport of phosphates. It was accordingly decided to re-open the Cambridge workings, and some thousands of tons of the so-called coprolites from the Trumpington bed were extracted. This coprolite is, however, of lower grade than that usually used for superphosphate manufacture, and consequently it had to be blended with the higher-grade rocks which were imported from outside sources. Later, however, with the change in the fortunes of war during the summer of 1918, the strain on British shipping was to a certain extent relieved. Consequently the State again returned to foreign sources of supply for raw phosphate, and the Trumpington workings were closed down.

It will be seen by reference to the statistics attached that in the normal pre-war year of 1913 a total of 539,016 tons of rock-phosphate and superphosphate were imported into the United Kingdom. The official statistics from which these figures are taken do not distinguish between the two materials, but so far as can be estimated from the sources of supply, about 460,000 tons of this quantity would be raw phosphate, and the balance, approximately 79,000 tons, would be in the form of superphosphate. The demand in the United Kingdom was mainly for superphosphate containing 26 to 30 per cent. of tri-calcium phosphate, which is manufactured from the grades of phosphate imported from Tunis and Algeria.

Some proportion of the high-grade rock-phosphate imported from the United States and the Pacific Islands was, however, used for the manufacture of the lower-grade superphosphate, the usual practice being to blend with the high-grade rock a proportion of the low-grade phosphates obtained from Belgium and France. It will be observed from the statistics which follow that, during the war period, an increasingly large proportion of the supplies for the United Kingdom was taken from Algeria and Tunis, the imports from the United States falling from 177,330 tons in 1913 to 13,361 tons in 1918. The principal reason for this variation is to be found in the shortage of shipping previously referred to. It will be obvious that in such circumstances it became vitally necessary to secure the major portion of the supplies of phosphate-rock from the nearest possible source.

It is of interest to note that in 1919, when the effects of the war were beginning to pass away, the imports from the United States rose to 47,800 tons, and at the same time the imports from Algeria and Tunis fell from 446,500 tons to 292,400 tons.

In the pre-war period the United Kingdom was one of the principal superphosphate manufacturing countries. America produced the largest quantity of superphosphate, the second and third places being occupied by France and Germany, with a production of approximately 1,800,000 tons each, the United Kingdom following with a production of about 800,000 tons.

World's Production of Phosphates (long tons)

	1913.	1914.	1918.	1919.
Egypt	102,771	70,789	30,646	28,893
Canada	344	852	125	21
Christmas Island	149,956	93,703	53,370*	—
Australia	5,950	6,783	11,918	9,017
New Zealand ..	11,000	10,743	5,000	4,000
Ocean Island ..	215,000	158,000	70,000	53,000
Nauru Island ..	133,000	72,000	83,000	60,000
Belgium	402,000	292,000	229,000	179,000
France	330,000	270,000	—	—
Norway	745	738	4,489	—
Russia	25,000	15,000	—	—
Spain	3,491	8,178	42,607	24,633
Algeria*	431,552	349,432	199,284	238,294
Tunis	2,038,476	1,373,171	848,632	820,000
Dutch West Indies*	39,000	96,000	—	9,890
United States ..	3,152,208	2,649,174	2,284,245	1,851,549
Formosa	5,531	1,317	—	—
Japan	18,737	37,644	189,181	120,893
Angaur Island ..	88,500	59,000*	—	—
Makatea	80,737	71,753	39,000†	39,000†
New Caledonia..	—	2,361	—	—

* Exports. † Estimated.

Chemical and Dyestuff Traders

The Chemical and Dyestuff Traders' Association have obtained an interesting ruling from the Board of Trade in reference to the position of arsenious acid, which is prefixed with the letter "R" in the list of articles included in Part I. of the Safeguarding of Industries Act. The acid referred to is the ordinary commercial article, white powdered arsenic, used in the enamelled ironware and glass industries and in the manufacture of certain arsenical products such as insecticides. The question put to the Board of Trade was whether arsenious acid of this quality would come in tax free, if used purely as a raw product for industrial purposes.

In their official reply the Board of Trade state "that arsenious acid of the grades generally used in industry and obtained by the usual metallurgical methods of roasting the ore and resubliming is not included in any of the lists which have been issued defining certain of the general descriptions of goods mentioned in the schedule of the Act, nor does it fall under any of the remaining general descriptions. The chemical in question is accordingly not liable to duty under Part I. of the Act."

Protection of Spanish Chemical Industries

A Spanish Royal Order, dated October 11, establishes a Commission of technical experts to investigate the question of the amount of protection necessary for the development of Spanish chemical industries. The commodities to be considered by the Commission (covered by Nos. 731 to 918 of the draft Tariff) include the following, in addition to chemicals properly so-called: Oils (other than mineral oils), soap, perfumery, glycerine, colouring materials, inks, varnishes, pharmaceutical products, oil seeds, dyeing and tanning materials, turpentine, gums, and other vegetable products. In making their recommendations the Commissioners will take into account, not only the chemical industries themselves, but also the industries utilising chemicals for further manufacture.

Safeguarding of Industries Act

Review of Two Months' Working

MR. W. J. U. WOOLCOCK, M.P., reviews at length in the *Times Trades Supplement* the working of the Safeguarding of Industries Act.

Granted the necessity of establishing key industries in this country, he writes, how far is it justifiable for consumers of the products of those industries to be made to contribute towards their establishment? Perhaps two typical instances may make the problem clearer.

Consider first the case of such a chemical as santonine, which is on the list of articles chargeable with duty under Part I. of the Act, because it is undoubtedly a fine chemical. Here is a product which in the present circumstances is not likely to be made in this country. The herb from which it is obtained is collected in Turkestan, and the santonine is extracted there and shipped to England. It is then liable to duty under the Act. The country benefits to the small extent of the revenue, but the manufacture is not established in this country, and cannot be unless some method of preparing it synthetically should be discovered.

The second example which may be considered is that of synthetic camphor. In this case the position is that natural camphor is obtained from the camphor tree grown in Formosa and elsewhere, and this natural camphor is a Japanese monopoly; camphor is also prepared synthetically by the Germans, and this camphor is now subject to duty. A substantial sum of money has already been spent in England in research work on the production of synthetic camphor, but the process is not yet perfected. Meanwhile manufacturers of celluloid, who use camphor in the process, will have to pay more for their synthetic camphor, at any rate until it is made here. This case differs from that of santonine in that ultimately synthetic camphor may be made in England whereas santonine is not likely to be. Both cases are typical of a number of articles which come within the Schedule to the Act, and will form the subject of appeals as provided for by the Act.

Cases before the Referee

The Lord Chancellor has now appointed Mr. Cyril Atkinson, K.C., to be the referee to decide complaints referred to him by the Board of Trade under Section 1 (5) of the Act. The procedure as communicated by the Board of Trade to complainants is that the complainant furnishes the Board with four copies of his statement setting out in detail the grounds upon which the claim is made, and notifies the Board whether he proposes to be represented before the referee, and, if so, by whom. The Board then prepare a statement of the grounds on which they rely in excluding or including an article from the list, and send a copy of this to the complainant. They also send copies of both statements to the referee, who fixes a date for hearing the complaint, which is advertised in the Press. The referee will call for further particulars if he requires them.

The first case to come before the referee is that of santonine, which will be heard shortly. The point may be raised, if the referee permits, whether the President of the Board of Trade has any discretion as to what articles he places on the list of articles chargeable with duty under the Act or whether the Act compels him to place every known article covered by the Schedule on the list.

So far the President's answers to questions in the House of Commons indicate that the department is clearly of the opinion that he has no discretion. This is possibly the correct view, but the case might be argued that as the Act is to safeguard certain industries unless a particular article was made in this country there was nothing to safeguard and therefore the article should not be on the list. This argument, however, ignores the fact that the Act is intended to safeguard the industry itself and not isolated products of the industry. The position at the moment, then, is that a very interesting case will no doubt be fought out before the referee, and perhaps even before higher authorities.

Menthol is also another substance which is under discussion at the moment; for practical purposes it is a Japanese monopoly. It appears in the list without any qualification, but in an answer to Colonel Nall, the President of the Board of Trade indicated that the question of the grades of menthol liable to duty was under review. The position of lactose or milk sugar is also of interest. Articles of food or drink are specifically excluded from Part II. of the Act, but no corresponding specific exclusion is found in Part I. The case will therefore turn on whether milk sugar is or is not a fine chemical. On the one hand, it may be argued that its use in the preparation of infants' foods and its undoubted food value is in favour of it being considered a foodstuff; on the other, that its inclusion in the British Pharmacopœia proves that it is a fine chemical.

What are Fine Chemicals?

Discussing fine chemicals Mr. Woolcock says :—

It is often very difficult to define precisely what is meant by even well-known trade terms. A manufacturer can usually state whether a particular chemical is a "fine" chemical, but to attempt a definition which shall be at one and the same time accurate and comprehensive is quite another thing. The most which can be said is that a "fine" chemical is one which—

(1) Is usually made in small quantities relatively to heavy chemicals, or/and

(2) Is of an exceptional degree of purity, or otherwise of special quality; and

(3) Requires skilled supervision in its manufacture.

Probably the last point is the most important element in the definition, bearing in mind the object with which the Act was passed. The manufacture of the chemicals in the Schedule is a key industry, not solely, or even mainly, because of the essential character of the substances, but because without the scientifically trained staff and workers which their manufacture gives this country would be at a disadvantage which might be fatal both in commerce and in war.

Anti-Dumping

Turning to Part II. of the Act, which deals with dumping, whether by sales below the cost of production or by reason of the depreciation of exchange, Mr. Woolcock states that the machinery has to be set in motion by manufacturers and traders. Complaints can be made through the Association of the trade or industry affected and, where no such organisation exists, by persons who may be regarded as representative of the trade or industry. In the first place a *prima facie* case has to be made out for the Board of Trade, and some doubt has been expressed as to the exact amount of evidence required by the Board. These doubts have now been removed in the course of conferences which have taken place with the Department, and it appears from communications addressed to complainants that the information regarded as necessary is as set forth below. The *prima facie* case should give :—

(1) The description of the article and full particulars of the sale.

(2) The country of manufacture.

(3) Evidence as to the price at which it was sold or offered for sale in the United Kingdom.

(4) Evidence as to the extent to which by reason of the sale or offer for sale employment in any industry in the United Kingdom is being, or is likely to be, seriously affected.

Where the dumping is due to sale below the foreign cost of production :—

(5) Evidence as to the wholesale price of the goods (or of goods as near as may be similar) sold for consumption in the country of manufacture.

Where the claim is based on the depreciation in currency :—

(6) Evidence as to price at which similar goods can be profitably manufactured in the United Kingdom.

(7) Evidence to show that the depreciation in relation to sterling of the currency of the country of manufacture is responsible for the fact that the prices at which the goods are sold or offered for sale in the United Kingdom are below the prices at which similar goods can be profitably manufactured in the United Kingdom.

Elaborating the headings above the Board desires more particularly to be furnished with the following information :—

(1) The brief statement of the nature of the materials used should include, in cases in which imported materials are used, any information as to the actual or probable extent of the dependence of foreign manufactures upon imported material.

(2) If there is more than one country of manufacture an indication should be given of the relative importance of the importations from each of the countries specified, and in particular the country or countries of whose competition complaint is made should be stated.

(3) In furnishing evidence as to the price at which the article was sold or offered for sale the approximate dates of the sale or offer should be stated.

(4) Evidence as to the effect of dumping on employment should show any recent changes in the volume of production of home manufactured goods and of employment. Particulars should be given covering the whole of the year 1913 and each quarter from January 1, 1920, to September 30, 1921, showing the quantity and value of the goods made, and the average number of males and females

employed and the hours worked per week. The statement should indicate the approximate percentage of the output of the whole industry with which it deals, and should furnish evidence of actual losses of orders attributable to the dumping.

(5) Evidence as to the wholesale price of identical or similar goods sold for consumption in the country of manufacture should be the best obtainable. It is realized that such evidence as invoice, &c., is not always reliable.

(6) The evidence required as to the price at which similar goods can be profitably manufactured in this country should be based on figures obtained from a sufficient number of representative firms. It should include a statement showing the total manufacturing cost now and before the war, divided to show the percentage represented separately by wages, materials, and overhead charges; and the pre-war normal profit and the present profit (if any).

(7) Some of the evidence as to the effect of the depreciation of exchange will have been given in the particulars referred to above, but in addition it is desirable that any information which can be obtained as to the selling prices of the goods in the foreign country, now and before the war, should be given. Any facts which may be known as to wage rates for equivalent processes both pre-war and now in this and the foreign country should also be furnished to the Department.

In conclusion, Mr. Woolcock admits that a great disparity in exchange value may render any duty valueless, but he adds: "It seems unthinkable that the exchange between this country and Germany can remain in its present state: it must either improve or the whole relationship of the world's commerce with Central Europe must be changed. For these reasons it is much too soon to say that the Act is of no use to anyone."

Chemical Works Organisation

Importance of the Chemical Engineer

At Armstrong College, Newcastle-on-Tyne, on November 9, Dr. W. B. Davidson, F.I.C., delivered the first of a series of lectures on "Chemical Works Organisation." The lecture was under the auspices of the Newcastle Section of the Society of Chemical Industry and of Armstrong College.

Dr. Davidson began by pointing out that chemical works organisation was a subject upon which there was a great deal of difference of opinion, and it was not at all an exact science. There were three main essentials to such work, the first being a suitable market for the product, and in that connexion he mentioned that many chemical waste substances offered no prospect of being economically recovered as pure chemicals, although they existed in abundance. The second essential was an adequate knowledge of special processes. He was of the opinion that many ventures had failed in the past because of this lack of knowledge—processes had not been thoroughly worked out, and amongst those he placed the early attempts at the manufacture of coalite and the attempts to recover oil from shale. The third essential was a sufficiency of capital to enable the *entrepreneur* to choose the best type of plant.

Amongst minor, but still important requirements he included the utilisation of by-products, the size of the plant, continuous working so far as possible and a suitable site. Another important thing was the question of disposal of effluents. Dealing with the assertion that German chemists were in advance of the British chemists so far as fine chemicals were concerned, Dr. Davidson said he was inclined to agree with Lord Moulton that Englishmen did not make sufficient preparation for the tasks they set themselves to do. It was not so much a difference in intellect as a difference in industry and willingness to study thoroughly the subject in hand. He pointed out also that Germany had a great advantage in having a sufficiency of chemical plant which was erected at pre-war costs, whereas to obtain a sufficiency of chemical plant in this country now would cost three times the pre-war figures. Dealing with personnel, he held that the chemical engineer, though—he was speaking practically—neither a chemist nor an engineer, was one of the most important officials in modern chemical works.

The lecturer emphasised the importance of keeping careful and complete comparative records of work done. In discussing handling and transport, he said that was possibly more an engineering question than a strictly chemical one, and was of the opinion that there was a tendency to have too many fancy engineering schemes. It should be borne in mind, Dr. Davidson concluded, that the more primitive methods of transport were very often more suitable than some of the schemes proposed.

Oil and Colour Chemists

Colour Measuring and Recording

A paper on "Theory and practice in colour measuring and recording" was read at the meeting of the Oil and Colour Chemists' Association on Thursday, November 10, by Mr. A. E. Bawtree. The author laid stress upon the necessity for oil and colour chemists to give a closer study to the question of colour than has hitherto been done, and laid down the following requirements for any system of standardising colour measurement and recording: (1) It must be permanent; (2) it should be to some absolute scale, so that the records of one firm can be compared with the records of another, and records of to-day can be compared with records twenty years hence; and (3) the system must be easy to convert from a piece of coloured material to a record in a book, and it must be equally easy to convert from the record in the book into a visual colour, and be able to be matched at some future time.

Following up the work done by Mr. Lawrence, and placed before the Association in January, 1919, on the development of the mathematics of colours, Mr. Bawtree has devised a system of scales, and has worked out a table, by which the hue, intensity, and purity of colours may be dealt with more or less on standard lines, in conjunction with his colour meter, which has already been described to the Association.

There was a short discussion on the proposals put forward by Mr. Bawtree, and the further discussion of the system was postponed until December 6. Replying, however, to some of the comments that were made, Mr. Bawtree said he believed that eventually the colour meter would be a cylinder, which would have a circular spectrum, and as this circular spectrum was advanced or retarded along its axis, so white light would be admitted to the field, and it would be possible to match a colour absolutely on the cylinder. He had some idea of how this would be done, but had neither the time nor the means to work it out.

Iron Portland Cement

Blast Furnace Slag as an Ingredient

At a meeting of the Glasgow Section of the Society of Chemical Industry held in the Institute of Engineers and Shipbuilders, Glasgow, on Monday night, Mr. J. H. Young presiding, Mr. E. H. Lewis, M.A., read a paper on "Iron Portland Cement."

Portland cement, the lecturer stated, was made by grinding together lime, silica, and alumina in the requisite proportions, burning to incipient fusion to produce a clinker, and again grinding this product to powder. Iron Portland cement was made by adding to clinker so made not more than 30 per cent. of blast furnace slag, which, although having a similar composition, was richer in silica because it contained calcium silicate, from which colloidal silica resulted on hydration. This action conferred additional strength on cement containing slag. Thus slag was to be regarded not as an adulterant, but as an improvement in cement. This conclusion was supported by figures showing increased tensile strength of cements containing added slag.

The influence of free lime and magnesia on cement was considered. Lime caused cement to burst after a time on account of the increase of volume by hydration and carbonisation. Free magnesia was similar, but slower in its action.

A Chemical Merchant's Affairs

The first meeting of the creditors of Emil Frederick Bush, 120, High Road, New Southgate, Middlesex, colour and chemical merchant, was held on Monday at 29, Russell Square, London, W.C. 1 (*see* The Chemical Age, Vol. V., p. 608). According to the statement of affairs the liabilities amounted to £2,327 0s. 8d., against net assets of £2,787 11s. 10d., or a surplus of £460 11s. 2d. It was stated that debtor started business in August, 1918, with £300 capital. Up to a year ago he appeared to have been doing a large business, but since then his turnover had fallen off considerably owing to the general depression in trade. His present position was also due to having purchased too large a stock and the subsequent depreciation. It was further stated that it was thought best to carry on the business for a while and dispose of the stock in the ordinary way of trading. The creditors eventually resolved to appoint Mr. F. W. Davies, C.A., 28, Theobald's Road, Bedford Row, W.C., as trustee, assisted by a committee of inspection.

October Trade Returns

Improvement in Trade Balance

THE Board of Trade returns for October show that our optimism in reviewing the previous month's figures was not without foundation. While the improvement shown in exports since June has been slow, it has undoubtedly been steady and progressive. The October figures show a smaller excess of imports over exports than has been recorded for any month since November of last year, when, apparently by reason of an incidental expansion in exports, the excess of imports temporarily shrank to less than one-half the normal for that time. It is interesting to note also that the value of imports for the month was £13,000,000 higher than the corresponding value in October, 1913, while the total exports were £16,000,000 higher, thus showing an improvement in the balance of trade for the month under review as compared with pre-war.

The following figures show the consistent advance in exports since June: June, £38,152,238; July, £43,172,399; August, £51,346,307; September, £55,247,578; and October, £62,265,379.

Chemicals and Drugs

The month's figures show decreases in the imports of a large number of chemicals, chief among which were calcium carbide, borax, tartaric acid, cream of tartar, red lead, and bleaching materials. There was, however, a great increase in the import of nitrate of soda. Detailed figures of the decreases are given below with the September figures in parentheses, the amounts being in cwts., unless otherwise stated: Acetic acid, 343 tons (422); bleaching materials, 2,478 (5,981); borax, 2 (1,380); calcium carbide, 37,688 (66,825); crude glycerine, 160 (309); distilled glycerine, 398 (511); tartaric acid, 702 (3,882); red lead, 1,303 (3,832); potassium nitrate, 12,599 (16,004); sodium compounds (other than nitrate), 9,255 (15,276); cream of tartar, 900 (2,251); zinc oxide, 358 tons (474). The one increase similarly compared is sodium nitrate, 148,138 (57,412).

Recovery in Tar Oil and Creosote

The increased export of sodium compounds in September is followed by a further increase of 86,504 cwt., but coal tar products are all down with the exception of tar oil, creosote, &c., which shows an increase of 732,417 gallons. The total of 804,780 gallons under this heading falls very much short of the August total of 3,275,794. The following figures show in detail the products which show increases over the September exports, the figures for the latter being in parentheses. The amounts are in cwts. unless otherwise stated: Sulphuric acid, 1,533 (1,497); tartaric acid, 878 (565); ammonia chloride (muriate), 356 tons (294); bleaching powder, 8,861 (6,092); tar oil, creosote, &c., 804,780 gallons (72,363); sulphate of copper, 442 tons (187); crude glycerine, 892 (nil); distilled glycerine, 2,885 (514); sodium carbonate (including soda crystals, soda ash and bicarbonate), 379,486 (325,169); caustic soda, 91,852 (55,991); sodium chromate and bichromate, 3,366 (2,320); sodium sulphate (including saltcake), 24,344 (17,089); and zinc oxide, 166 tons (30). The following show decreases: Sulphate of ammonia, 11,558 tons (12,262); benzol and toluol, 24 gallons (2,192); carbolic acid, 5,150 (5,160); naphtha, 3,411 gallons (7,101); naphthalene, 892 (3,594); coal tar products, other sorts, 14,201 (18,128); potassium chromate and bichromate, 778 (915); potassium nitrate, British prepared, 867 (1,076); and sodium compounds, other sorts, 48,493 (60,468).

Dyes and Dyestuffs

For the first time since July the returns record the importation of coal tar intermediates amounting to 2 cwt. We imported 28 cwt. of alizarine and 1 cwt. of synthetic indigo, both these amounts being less than the September figures; coal tar dyes, other sorts, however, mounted to 1,192 cwt. as against 763. Cutch is down at 1,471 cwt. as is indigo, natural, at 7 cwt. There was an increase of 3,336 cwt. in the export of dyes and dyestuffs during the month, the total being 12,636 cwt. as compared with 9,300.

Imports of painters' colours and materials mostly show increases, the comparative figures being: Barytes, ground, 34,228 cwt. (38,891); white lead (basic carbonate), 6,369 cwt. (4,344); and painters' colours, &c., other sorts, 40,421 cwt. (46,468). Exports of painters' colours were up again, the month's total being 83,909 cwt. as against 76,995 in the previous month.

Scientific Instruments and Glassware

Scientific, illuminating, optical, &c., glassware was imported to the extent of 50,438 cwt., valued at £167,443, as against 35,633 cwt. to the value of £121,527 imported in September. Exports under this heading amounted to 2,237 cwt., of the value of £42,593. The previous month's total was 1,835 cwt., valued at £33,874. During October we imported 75,700 gross of glass bottles and jars valued at £84,483 and exported 28,937 gross, valued at £52,331.

Scientific instruments and appliances (except electrical) were imported to the value of £34,091. Of this sum the U.S.A. had £13,383 and Germany came next with £11,413. We exported £93,330 worth of scientific instruments, our largest single customer quoted in the Returns being British India.

At 3,405,972 tons, our coal exports were slightly less than the previous month's, 3,406,579, and the value, at £4,851,452, was £342,904 less.

Key Industries and Research

House of Lords Debate

IN the House of Lords on November 10 Lord Crewe called attention to the hardship caused to teachers and students of science in universities and colleges by the application of the provisions of the Safeguarding of Industries Act to the apparatus and material necessary for education and research in chemistry and physics. He said that the Safeguarding of Industries Act and the German Reparation Act had exercised a distinctly hampering effect upon both research and the teaching of many branches of science. A great many substances required by professors of chemistry and physics and engineers were now subject to high penalties before they could reach those who had to use them. He had received letters on the subject both from professors engaged in research and from advanced teachers. A distinguished professor of chemistry at one of the older universities wrote that there was no doubt that these Acts had had the effect of appreciably diminishing the amount of research work that could be done in the laboratory. This applied specially to the Reparation Act. The delay, he said, was never less than three months in the delivery of chemicals required for research.

There was also delay in getting German books. He was told by a distinguished professor that a large number of the subjects required for research in organic chemistry could not be, and never would be, prepared in this country. A German price-list contained 1,863 chemicals and solutions, and an English price-list contained only 678, and one of the principal chemical manufacturers in this country told the professor that while they could make some of the substances absent from their list if they could get a market for them, they could not make the others in any circumstances.

It was suggested that the situation might be met by increased grants from the State to universities and colleges, but that would mean the expenditure of a far larger sum of money than was gained from the duties. He asked the Government to invite the President of the Board of Education and the authorities of the Departments of Scientific and Industrial Research to look closely into the question and see whether the grievances he had instanced were not well founded, and whether they were not having a most discouraging and preventive effect upon the studies of those departments.

Viscount Haldane said he wished to bring to light the extreme difficulties with which research was faced for the moment because of the system, and to ask the Government to take steps to get rid of the difficulties or mitigate them. Professors were suffering great hardships at the present time. With regard to optical glass, it was desirable that we should make our own, but he doubted very much whether the industry was going to gain much by production.

Lord Buckmaster did not think the extent to which the scientific student suffered under this burden was properly appreciated. It was, he said, a little short of intolerable that the heavy hand of this scheme of protection should be put on the branch of education which deserved every kind of encouragement.

Government Reply

In his reply Viscount Peel said the sole purpose of the Safeguarding of Industries Act was the developing in this country of scientific products for which, before the war, we were dependent upon foreign countries, and notably Germany.

A great deal of valuable work in that direction had been done by bodies engaged in scientific research, and by groups of manufacturers, assisted by the Department of Scientific and Industrial Research. But there would be no inducement to advance this work unless manufacturers were assured that their markets would not be destroyed by an influx of foreign products. If the requirements of scientific and educational institutions imported from abroad were to be exempted from duty the assistance given by the Act to manufacturing industries would be diminished, and, besides, it would be difficult, if not impossible, to say which institutions should be given the exemption and which should not.

As regards the question of cost, the cost of the production of these things was quite small to the running and working of these laboratories. It had always been a complaint that there were very few opportunities for scientific workers in this country. Supposing this Act was a success, and in four or five years' time these industries could stand by themselves, a very much wider field would be provided for scientific workers, and if scientific men would help manufacturers the development would be very much expedited. If the Act were repealed we should get back to the position we were in before the war and be dependent upon Germany and other countries for the supply of these goods. He promised to see that the whole subject was placed adequately before the Minister of Education.

Commercial Applications of Dyestuffs

Some Physico-Chemical Aspects

At a meeting of the Hull Chemical and Engineering Society, held on Tuesday at the Wilberforce Café, Hull, Mr. A. R. Tankard, F.I.C., presiding, Mr. F. G. Stephan read a paper on "The Manufacture and Application of the Chief Commercial Dyestuffs," in the absence, through illness, of Mr. J. Pryce Jones, who was to have read a paper on "Some Applications of Physical Chemistry to Industry."

The general methods of the manufacture of intermediates were first described as being applicable to the manufacture of the individual dyestuffs. The effect of such radicles as the sulphonic acid, alkyl, alkyoxy, halogen, &c., upon the solubility, shade, fastness, &c., of the finished products was explained. In the case of the Azo colours, experiments proved that temperature, concentration, and catalysts exerted a considerable effect both upon the product and the final yield.

The physico-chemical aspects of the chief groups of chemically allied dyestuffs were considered and the manufacture of some of the more important outlined. Armstrong's quinonoid theory of colour was discussed in the case of the triphenylmethane group of dyes.

The lecturer further stated that apart from their value in dyeing, dyestuffs were used to advantage for many other purposes. In medicine, for example, brilliant green had been used during the war to promote granulation in the case of large open wounds, whilst fluorescein was used to detect corneal lesions. Bacteriology required pure dyestuffs for microscopic stains, eosine and methylene blue being the most important. Dyestuffs were also used in the manufacture of all kinds of inks, lakes, pigments, spirit varnishes, &c., and also for colouring foodstuffs, soap and perfumes, &c.

In analytical chemistry A-nitroso-B-naphthol, although useless as a dye, was used as a test for cobalt, and methylene blue figured in many reactions with titanium chloride as a reducing agent.

Although made only on a very small scale, the isocyanines, pinacyanol, orthochrome T., &c., were very important for making orthochromatic, isochromatic and panchromatic plates for photographic purposes. Colour screens and filters likewise demanded the use of various dyestuffs having the necessary absorption spectrum. The lecturer supplemented his remarks with a number of drawings from actual works practice.

German Professor's Appointment

Professor A. Stock has been appointed director of the Kaiser-Wilhelm Institute of Chemistry, Berlin, in succession to Professor Beckmann, who has retired. Professor Stock has also been appointed commissioner for the execution of Article 172 of the Peace Treaty, under which the German Government is required to furnish information concerning certain chemicals and their methods of production.

Secret Research in Universities

The State and Chemical Warfare

Speaking at the annual general meeting of the Council of the National Union of Scientific Workers, held on November 12 at the University of London Club, Professor L. Bairstow, the retiring President of the Union, said the part played by the scientific worker was scarcely understood by many of the advisers of the Government, and during the present campaign for economy it was perhaps worth while to attempt some enlightenment.

During the year, he said, an attempt had been made by the War Office to encroach on the very limited resources of the universities. It had been suggested that professors should have charge of secret laboratories working on the preparation of life-destroying chemicals. As a union they were not connected with the rights or wrongs of chemical warfare; their objection to the proposal was primarily to the idea of the War Office attaching parts of their universities to itself. The introduction of secret research into the universities cut at the root of the freedom to pass on knowledge, which freedom was the basis of sound education as well as a great privilege, and should be defended with all their strength.

Professor Bairstow said that by growing and linking up with kindred organisations the proud state might be reached when scientific workers could present a collective opinion on matters of primary importance in the scientific work of the nation. The negotiations now proceeding with the British Association of Chemists with a view to an early amalgamation of the two bodies promised well and brought them nearer the desired goal. Funds would become available, it was hoped, for Parliamentary activities, and thus enable the members of both to make fuller use of their legitimate powers as citizens.

Among the resolutions submitted to the Council was the following, moved by Dr. Dorothy Wrinch and seconded by Professor Levy: "That this Union urges the Council of the League of Nations to form a section composed of representative scientific workers to study, confer, and report on all matters upon which scientific advice can appropriately be given." This was carried without opposition.

Sixteen candidates were nominated for the nine seats on the Executive Committee, and the following were elected: Professor L. Bairstow, Dr. J. W. Evans, Dr. F. Kidd, Dr. H. L. Jameson, Mr. S. W. Melsom, Major C. J. Stewart, Professor H. H. Turner, Dr. J. H. Vincent, and Mr. R. McKinnon-Wood. Professor J. Stanley Gardiner was elected President of the Research Council for the ensuing year, with Dr. Harold Jeffreys as secretary. Dr. A. A. Griffith was elected President of the Union.

At the annual dinner which followed the meeting of the Council, Sir Frank Baines, the principal guest, welcomed the growing movement for association among scientific workers, who hitherto had been, perhaps, more individualistic than any other class of professional persons. Research workers, he said, should, in their unity, be strong enough not only to prevent the exploitation of themselves by private and capitalistic enterprise, but to confer on the community the benefits arising out of their labours.

Marking of Goods Imported into Canada

The Canadian Customs Department has made further concessions to importers in connexion with the Act demanding the marking of all imports with the country of origin. It was announced on Wednesday that goods ordered in good faith before October 1 last will not be subject to the penalty of 10 per cent. if they are unmarked, although they will not be released from the Customs until properly marked. The time for the importation into Canada free from the penalties of the Marking Act of goods ordered before October 1 has been extended to July 1 next.

Cambridge Fellowship for Dr. Chadwick

The governing body of Gonville and Caius College have elected Dr. J. Chadwick a Corporate Fellow of the college. Dr. Chadwick graduated at Victoria University, Manchester, in 1911, and, after having been interned at Ruhleben throughout the whole period of the war, has been working in the Cavendish Laboratory under Professor Sir Ernest Rutherford since Michaelmas, 1919. In the Easter term, 1921, he was awarded the Ph.D. degree for a thesis upon "The Nuclear Theory of Atomic Structure."

Sewage Gas as Motive Power

Interesting Developments at Birmingham

SOME interesting experiments at the sewage works in Birmingham are understood to have led to the practical utilisation, in a limited way, of marsh gas, which is formed by organisms acting upon decaying vegetable and other organic substances. These experiments were detailed by Mr. John D. Watson, the Board's engineer, at a conference in Birmingham, on November 12, of the Institution of Municipal and County Engineers. They afterwards visited the sewage works, the company including a number of research workers and industrial chemists.

Mr. Watson pointed out that his desire was to suggest a source of power hitherto overlooked or minimised and to describe experiments which were calculated to stimulate further inquiries into the possibilities of utilising the marsh gas which was formed by organisms acting upon decaying vegetable and other organic substances. On the Birmingham works an intensive fermentation process was adopted in order to render vast quantities of sludge inoffensive without destroying its fertilising properties or lessening its calorific value. There were marked differences between crude sewage sludge before it entered upon the septic stage and the sludge after it had reached that stage. During the digestion process sludge was lighter than water, but what at first sight appeared to be a reversal of the law of gravitation was a delusion: it was merely an instance of solid matter being held up by gas formed in the course of the putrefactive change which took place when organic matter was acted upon by bacteria and their enzymes.

The principal constituents of sewer gas are methane, hydrogen, nitrogen, and carbon dioxide. It was upon the methane that chief reliance was placed. The analysis of gas made in September at Birmingham was as follows: Carbon dioxide, 18·1; hydro carbon, 0·2; oxygen, 0·4; carbon monoxide, 1·1; methane, 77.0; ethane, trace, and nitrogen, 3.2. B.T.U. per cubic foot, 700. Results from a wide selection of places in different parts of the world seemed to indicate that marsh gas was evolved from organic matter as readily in one climate as in another; but, in fact, it is not so, and the results of the analyses showed the need for more definite information and caution in their application.

The results obtained by Mr. T. F. E. Rhead, chief chemist to the Birmingham Gas Department, in his analysis of the marsh gas at Colehall, Birmingham, emphasise this statement. Steps were being taken to investigate the facts with a view to preparing graphs which would show (1) the volume of gas to be obtained from a given volume of average sludge (10 per cent. dry solid matter) in a given time; (2) one which showed at what time the sludge gave off the maximum quantity of gas, and what time was needed to change that maximum into a minimum. The author was of opinion that it was from sludge and not from liquid sewage that gas could be obtained in sufficient volume to render its use economical.

Notwithstanding existing weaknesses in the experimental plant, the fact remained that the engine had worked successfully and given out the power required to drive the pump. The plant was designed to give 25 B.H.P. for a working period of six hours per day. It comprised a 34 (max.) H.P. horizontal gas engine of the ordinary suction type, a 5-in. centrifugal sludge pump, a small sludge pump well, and a sludge digestion tank in two sections constructed of cement concrete. There yet remained to be erected a small gas holder, without which it was impossible to keep the engine running for more than an hour and a half or two hours consecutively. From the limited experience available it was estimated that about two tons of wet sludge (10 per cent. dry solid matter) per day would be required to provide an explosive gas capable of generating 25 B.H.P. for a working period of six hours per day.

The sludge after it had been discarded would probably be freer of fat and grease than it was before fermentation, and to that extent it would be more valuable to farmers than it was in its initial stage; moreover, it would still retain about 2 per cent. of nitrogen after it had given off its methane, so that the fertilising properties were not thereby exhausted. Mr. Watson was of the opinion that the sewage gas plant could be cheapened when more exact knowledge of the principles of working had been obtained.

A line of investigation essential to ascertaining the volume of gas which could be evolved from a given quantity of sludge was the influence of agitation.

British-American Unity

International Greetings between Chemical Clubs

IN THE CHEMICAL AGE of October 22 we published the terms of a message of greeting conveyed by Captain Goodwin, as representing the Chemical Industry Club, London, to the Chemists' Club, New York, during the visit of the Society of Chemical Industry. The following reply has now been received from the New York Club:

Dear Mr. Coley,—Your letter of the 10th of August was duly conveyed to the Chemists' Club through the kind offices of Mr. C. J. Goodwin, but as the period was not one where the message could be delivered to the members of the club, or at least the trustees, it had to take place at a joint meeting where several of the members of the Society of Chemical Industry of both London and New York were present.

It is needless for me to say that letters of this sort passing between the various countries where English is spoken can only do good and can never do harm, more especially when they are knitted together in one common cause; that is, the uplifting and the spreading of science throughout the English-speaking races.

Another point, which perhaps is hardly to be mentioned, in connection with this is the enormous political influence that such associations may have. Although there may be many occasions when one hears adverse criticism, those who do not know the American public as well as the writer will hardly realise the position as I see it. Every American thinks it his bounden duty to criticise everything he sees and hears. Whether it be his own brother, his own father, or his own mother, or his college chum, or anything outside of the country he criticises, but always, I think, without exception, in a friendly way, never doing it with that nasty spirit which we have been so frequently confronted with by some of the European nations—we need not mention any names—but living here amongst them as I do I find the criticism is always friendly, and it is my pleasure to pass to you the friendly feeling which the whole of the Chemists' Club feels toward the Chemical Industry Club, and you may rely upon the trustees and the management in general doing all they can to assist anyone who should come recommended by the Chemical Industry Club, not only as it has been done in the past, but it is hoped that a greater bond will be cemented in the future by the friendship which has already been started mostly by the help of Mr. Coley in the kind way which he has sent visitors to us with all sorts of good words.

On behalf of the trustees and officials of the Chemists' Club I have again to thank you for your kind greetings and also to thank Mr. C. J. Goodwin, who so kindly conveyed by word of mouth the feelings that have existed between the two clubs, and which he hoped and we also hope will exist for many years to come.—With kindest regards, sincerely yours,

T. R. DUGGAN, Trustee.

New Chairman and Sub-committees

At the meeting of the newly-elected executive committee of the Chemical Industry Club, on Monday evening, Mr. A. G. Craig was elected chairman for the ensuing year in succession to Dr. W. R. Hodgkinson, resigned. Mr. Craig has long been associated with the development of the club, and is a very popular member. He is managing director of the firm of Arthur T. Dimmock, Ltd., and a director of the firm of Allen, Craig & Co. (London), Ltd., both firms being connected with the chemical industry as merchants. Mr. Craig is also a prominent Freemason, and is at present Worshipful Master of the Radium Lodge No. 4031. Trained for the legal profession, Mr. Craig transferred his energies to commerce generally and to chemical industry in particular. He has always associated himself with all kinds of sport and social functions, and is well fitted to guide the club in its business of providing social facilities for those connected with the chemical industry.

Among other business transacted at the meeting of the committee was the election of the following special sub-committees:

Selection Committee.—Dr. Tripp, Mr. R. B. Pilcher, Mr. Ashley Carter, and Mr. A. J. Chapman.

House and Finance Committee.—Captain Goodwin (Treasurer), Dr. Dehn, Dr. Wilbraham, and Mr. Melville Smith.

General Purposes Committee.—Dr. Hodgkinson, Dr. Ormandy, Dr. Rule, Mr. F. E. Hamer, Mr. W. Graham, and Mr. Harley Knight.

Mr. W. Cullen, the newly-appointed hon. assistant secretary is the convener of all sub-committees.

Chemical Matters in Parliament

Nauru Island Phosphates

Mr. Mosley (House of Commons, November 9) asked the Secretary of State for the Colonies the financial result of the trading under the Nauru Island Agreement of July 2, 1919: what quantity of phosphate had been supplied to the United Kingdom, Australia, and New Zealand respectively; whether any, and, if so, what profit had resulted from the supply of phosphates to those countries which were not within the agreement; and whether the agreement had been ratified by the League of Nations?

Mr. Wood said he had no information with regard to the first three parts of the question, but inquiry would be made of the British Phosphate Commissioners. The answer to the last part of the question was in the negative.

Chlorate of Potash

Dr. Murray (House of Commons, November 9) asked the Financial Secretary to the Treasury whether he was aware that in the lists of commodities defining the key industries schedule ordinary chlorate of potash was included, and that, in consequence, a duty of 33⅓ per cent. was levied on consignments which arrived in this country early in October, and that the Department had since removed this item from the official lists; whether, seeing that this constituted an admission that the commodity was wrongly included at first, the duties already paid by the importers would be refunded to them; and what action was he taking to publish the fact that, although this commodity was supposed to be liable for duty, yet henceforth no duty would be levied?

Mr. Young said he was aware of the fact that the item "potassium chlorate" was shown on the Board of Trade list without the qualifying letter "R" which should have been prefixed. The error had been corrected by notice in the *Board of Trade Journal* of October 20 (*see* THE CHEMICAL AGE, Vol. V., p. 493), and in any case where duty had been levied on importations of this article which could be shown not to have been of "R" quality the duty would be refunded. The Commissioners of Customs had issued instructions accordingly.

Scientific Glassware

Replying to Dr. Murray, who asked why measure (glass) forms were held to be liable to key industries duty when they were imported previous to being graduated and engraved, while glass jugs of all sizes, imported for graduation, were admitted free of duty, Sir W. Mitchell-Thompson (House of Commons, November 9) said certain types of measure and test glasses, whether graduated or ungraduated, were included in the list of dutiable articles falling under the heading of scientific glassware. Glass jugs were not scientific glassware and consequently were not dutiable.

Key Industries Complaints

In reply to Mr. Briant (House of Commons, November 9), Sir W. Mitchell-Thompson said the remuneration of the referee under Section 1 (5) of the Safeguarding of Industries Act would depend upon the amount of work which he might be called upon to do, and would be a charge upon the Board of Trade Vote. It was open to complainants to be represented by counsel should they so desire, but it was not the intention of the Board of Trade to employ counsel unless the complainants were so represented.

Storage of Celluloid

Mr. Hayward (House of Commons, November 10) asked the Home Secretary whether his attention had been called to the fact that Mr. H. E. Winny, inspector of explosives to the City of London Corporation, when giving evidence at an inquest into six fires which occurred at 39, Cripplegate within a period of nine weeks, stated that the Corporation had attempted to obtain legislation with regard to the storing of celluloid, but that they and the London County Council had been successful only in the cases of films and celluloid sheets; and whether, in view of the fact that there was a large quantity of celluloid in the City, he was prepared to promote legislation which would confer wider powers on county and municipal authorities as regards storage?

Mr. Shortt said the question of further legislation to deal with celluloid dangers was under consideration, but to extend regulations to all premises in which comparatively small stocks of celluloid articles were kept would involve many difficulties.

Import Licences for Benzaldehyde

Major Barnes (House of Commons, November 10) asked the President of the Board of Trade whether he was aware that Messrs. Stephens Brothers & Co., 13A, Finsbury Square, E.C.2, made application on September 15 last to the Dyestuffs Advisory Licensing Committee for a licence to import a quantity of benzaldehyde; that on September 21 they were directed to approach British manufacturers for this commodity; that on September 22 they replied that the British material was not satisfactory for their purpose; that on September 27 they were asked to state in what respects it was not satisfactory and to furnish evidence that the material would be utilised exclusively for silk making; that on the same day, the goods already being in London, they again asked for a licence; that on September 28 they gave the information asked for, and on September 30 received a licence, No. L2,153 E, dated September 30, 1921, for the goods; that on the presentation of this to the Customs House, London, they were not able to obtain possession of the goods, and on October 28 acquainted the secretary of the Dyestuffs Advisory Licensing Committee of that fact, and on October 31 were advised that the Licensing Committee could not intervene; whether Messrs. Stephens Brothers were now asked to pay 33⅓ per cent. tax on this material; and whether he was prepared to take any action to enable this firm to obtain these goods without the additional costs?

Sir P. Lloyd-Greame said he was having inquiries made into this case, and would communicate the result.

New Industries

Captain Wedgwood Benn (House of Commons, November 10) asked the President of the Board of Trade whether he could give particulars of the steps which were being taken to manufacture in this country articles protected by Part I. of the Safeguarding of Industries Act which were at present only obtainable abroad?

Sir P. Lloyd-Greame said that, apart from the activities of certain industrial research associations, such information on this subject as had come to the knowledge of the Board of Trade had been given confidentially by manufacturers engaged in, or intending to take up, particular lines of production; and he did not think it would be proper to make such information public.

Affairs of Solac Ltd.

A COMPULSORY winding-up order was made against Solac Ltd., of 221, Tottenham Court Road, W.1, on July 26 last, and on November 4 the statutory first meetings of the creditors and contributories were held at the Board of Trade Offices, Carey Street, W.C.2. The Official Receiver (Companies Winding Up), who presided, reported that the company was registered in March, 1915, with a nominal capital of £45,000, with the object of acquiring and working certain patents for the manufacture of synthetic milk from soya beans. The company also acquired an option to purchase certain secret processes for the manufacture of nut butter, but did not avail themselves of it. Resolutions were passed for the appointment of Mr. J. A. Godwin, chartered accountant, 195, Strand, as liquidator. During the course of the meeting it transpired that the Official Receiver was selling the properties of the company to a new company for a share consideration, and that arrangements would be made for the unsecured creditors to receive cash and shares in satisfaction of their claims. The assets were stated to amount to £43,354 and the debenture claims to £44,117, while the claims of the unsecured creditors amounted to £4,599.

Brunner Mond and Ship Canal Litigation

IN the Court of Appeal on Monday, before Lord Justice Bankes and Lord Justice Scrutton, Mr. Kennedy, K.C., applied on behalf of all parties that the appeals in the two cases of the Attorney-General against the Manchester Ship Canal Company, and the Manchester Ship Canal Company against Brunner, Mond & Co., should be taken on December 12. Mr. Kennedy stated that there had been serious attempts to settle the cases, but they were not successful.

Their Lordships intimated that the appeals had stood over so long that they must more or less take their chance. They would take them if possible, but they could not promise so long ahead.

From Week to Week

The death took place on November 8 of MR. JOHN SPILLER, consulting chemist, of 2, St. Mary's Road, Canonbury, London, N.

The Council of the University of Wales have sanctioned the appointment of an independent LECTURER IN AGRICULTURAL CHEMISTRY at Bangor.

At a meeting of the Andersonian Chemical Society, in Glasgow last week, MR. J. S. MERRYLEES gave a lecture on the "Manufacture of Sugar."

Applying an oxy-acetylene burner to an empty glycerine drum at the Port Sunlight Works of Lever Brothers, Ltd., on Thursday, James Wright, a boiler-maker, was killed by an explosion, the end of the drum being blown into his face.

DR. P. PHILLIPS BEDSON, late of the Armstrong College, Newcastle-on-Tyne, has now taken up his residence at "Colwyn," Victoria Avenue, Sanderstead, Surrey.

Grants from the Gilchrist Fund for the PURCHASE OF SCIENTIFIC APPARATUS were passed at a meeting of the Edinburgh University Court on Tuesday.

Messrs. Moore of Trafford Park, Ltd., chemical manufacturers, Manchester, announce that they have opened a London office at 11, Queen Victoria Street, E.C. 4.

The Council of the Chemical Society have appointed DR. J. IRVINE MASSON to fill the secretaryship of the Society, rendered vacant by the death of Dr. H. R. Le Sueur.

THE DAVY MEDAL of the Royal Society has been awarded to Professor Philippe A. Guye for his researches in physical chemistry. Professor Guye is professor of chemistry at the University, Geneva.

LORD LEVERHULME arrived in Liverpool on Tuesday from West Africa. He went on holiday to Teneriffe to meet his son and other representatives of Lever Brothers, Ltd., who have been touring in Nigeria.

The death occurred on November 8, at Bidston, near Birkenhead, of MR. WILLIAM P. EVANS, Chairman of Evans, Sons, Lescher & Webb, Ltd., of Liverpool. Mr. Evans had been in failing health for some time.

Sir Andrew R. Duncan is chairman of the newly-appointed ADVISORY COMMITTEE FOR COAL AND THE COAL INDUSTRY. Sir George Beilby, Sir John Cadman, and Mr. D. Milne Watson are among the members of the committee.

Sir Howard Frank, Chairman of the Disposal and Liquidation Commission, informed a Press representative on Tuesday that the Disposals Board had disposed of 67,000 TONS OF CHEMICALS AND EXPLOSIVES during the last twelve months.

At a meeting of the Senate of London University on Wednesday afternoon a resolution was adopted that the recently-erected inorganic and physical chemistry LABORATORIES AT UNIVERSITY COLLEGE should be named after the late Professor Sir William Ramsay.

In addition to the papers already announced, the following paper was read at the meeting of THE CHEMICAL SOCIETY at Burlington House, W.1, on Thursday evening: "Researches on sulphuryl chloride, Part. I. Influence of Catalysts. A Convenient Method of Chlorinating Benzene," by Dr. O. Silberrad.

At Glamorgan Assizes at Cardiff on Monday Mr. Justice Rowlatt was informed that the case of the ANGLO-AMERICAN OIL CO., LTD., against M. J. Goode, of Park Street Garage, Swansea, had been settled. The action was one claiming £239 for oil supplied, and defendant agreed to judgment for this amount.

MR. EDGAR P. CHANCE, Birmingham, has consented to serve on the special panel to be appointed to assist the Railway Rates Tribunal in its deliberations on technical points arising in the fixing of rates on behalf of the chemical industry. His name has been forwarded to the Association of British Chambers of Commerce.

The address voted by Cambridge University to DR. G. D. LIVEING, formerly Professor of Chemistry, was presented on November 13, the date on which he matriculated seventy-five years ago. The presentation was made by the Vice-Chancellor, Dr. Pearce, at St. John's College, in the presence of a large number of Dr. Liveing's friends.

THE ANNUAL GENERAL MEETING of the Faraday Society will be held in the rooms of the Chemical Society, Burlington House, W. 1, on Tuesday, December 13, at 7.45 p.m. At the conclusion of the meeting Professor A. O. Rankine will deliver an address on "The Structure of Some Gaseous Molecules," which will be followed by a general discussion.

The Society of Chemical Industry will hold A JOINT MEETING with the Institution of Mechanical Engineers at Storey's Gate, S.W., on January 6, 1922, when Mr. G. M. Gill will read a paper on "The Co-operation of the Engineer and Chemist in the Control of Plants and Processes." Non-members of either body may obtain tickets of admission from the General Secretary of the Society of Chemical Industry

MR. WILLIAM SMITH DENHAM, D.Sc., F.I.C., has been appointed Director of Research to the British Silk Research Association. He was previously senior chemist at H.M. Chiswick Laboratory, lecturer in chemistry at the University of St. Andrews, Research Fellow of the University of St. Andrews, and lecturer in chemistry at the Royal Technical College, Glasgow. Mr. Denham commences his duties on December 1 next.

The thirty-third anniversary of the founding of N. POWELL & Co., chemical manufacturers and merchants, of Sandhurst Road, Bombay, and the sixtieth birthday of Dr. A. L. Nair, the founder, were celebrated in Bombay on November 8. Dr. Nair has recently made an extensive tour of China, Japan, the United States of America, and Europe. William Allison & Co., of 59-60, Gracechurch Street, London, E.C. 3, represent the firm in the United Kingdom.

In the course of a lecture delivered recently at Nancy, Professor Camille Matignon, of the Société de Chimie Industrielle, stated that the ALSATIAN POTASH MINES, which covered 180 sq. kilometres, could supply the world's requirements for 300 years at the pre-war rate of consumption. The German mines with their 1,500 sq. kilometres and 200 pits could supply the requirements for 7,500 years, but from the standpoint of ease of extraction the advantage lay with Alsace.

S. H. TRAVIS & Co., manufacturing chemists, etc., of 151, Wool Exchange, Coleman Street, E.C. 2, announce that in order to group their London establishments—offices, works, and warehouse—more conveniently together, they have taken larger premises, and from Monday, November 14, their address will be 33, 35, and 35a, King's Road, St. Pancras, London, N.W. 1. Their new telegraphic address is "Avichemtra—Camroad—London," and their new telephone numbers, "North 1130-33."

The second meeting of the Edinburgh and East of Scotland Section of the Society of Chemical Industry was held on Tuesday, Dr. H. E. Watt in the chair. Mr. W. O. Kermack, of the Royal College of Physicians Laboratory, read a paper on "Phyto-synthesis," in which he referred to the peculiarity of the SYNTHETIC ACTIVITIES OF THE LIVING CELL and the various theories which had been put forward to explain how the various substances found in plants were built up. The modern theories, particularly those on the synthesis of carbohydrates, were also dealt with.

The directors of the Manchester Chamber of Commerce have sanctioned resolutions which the Chemical and Allied Trade Section of the Chamber desire to bring before the Board of Trade. The resolutions state that the SAFEGUARDING OF INDUSTRIES ACT has gone outside its avowed objects, which were limited to the safeguarding of British key and infant industries, and has caused much confusion in certain sections of the chemical trade and the even larger section of chemical consumers owing to the inclusion in the schedule of a large number of articles not made in this country, nor likely to be made within the next ten years.

In the course of an address in London last week on "Eclipses of the Sun and Moon," Sir Frank Dyson referred to the discovery of A NON-INFLAMMABLE GAS. As the result of astronomical observations in 1868 Sir Norman Lockyer discovered a yellow line near the sodium line to which he gave the name of helium. Years afterwards a similar form of gas was discovered on the earth by Sir William Ramsay. It was found to be a light gas, not so light as hydrogen, and with this difference, that it was not inflammable. At first it was thought that this gas might be used for inflating dirigible balloons, and at the time of the war such a discovery might have proved of inestimable value.

References to Current Literature

British

ACIDS. Experiments on the synthesis of the polyacetic acids of methane. Part III. Conditions controlling synthesis by the cyanoacetic ester method (*continued*). C. K. Ingold and E. A. Perren. *Chem. Soc. Trans.*, October, 1921, pp. 1582-1601.

BASES. *ortho*-Chlorodinitrotoluenes. Part III. Bases derived from 2-chloro-4 : 5-dinitrotoluene. G. T. Morgan and W. A. P. Challenor. *Chem. Soc. Trans.*, October, 1921, pp. 1537-1546.

PHYSICAL CHEMISTRY. Surface tensions of salts of the fatty acids and their mixtures. E. E. Walker. *Chem. Soc. Trans.*, October, 1921, pp. 1521-1537.

The molecular conductivity of some sulphonium compounds in acetone. P. C. Rây and K. Kumar. *Chem. Soc. Trans.*, October, 1921, pp. 1643-1644.

Physical chemistry of the oxides of lead. Part I. The solubility of lead monoxide. S. Glasstone. *Chem. Soc. Trans.*, October, 1921, pp. 1689-1697.

ALKALOIDS. Harmine and harmaline. Part V. The synthesis of norhaman. W. O. Kermack, W. H. Perkin, jun., and R. Robinson. *Chem. Soc. Trans.*, October, 1921, pp. 1602-1642.

COMBUSTION. The propagation of flame in mixtures of ethylene and air. W. R. Chapman. *Chem. Soc. Trans.*, October, 1921, pp. 1677-1683.

HYDRATION. The hydration of the fibres of soap curd. Part III. Sorption of sodium palmitate. M. E. Laing. *Chem. Soc. Trans.*, October, 1921, pp. 1669-1676.

ALKALIS. The mechanism of the action of fused alkalis. Part II. The action of fused potassium hydroxide on phenylglyceric acid. H. R. Le Sueur and C. C. Wood. *Chem. Soc. Trans.*, October, 1921, pp. 1697-1700.

METALS. The effect of temperature on platinum black and other finely-divided metals. R. Wright and R. C. Smith. *Chem. Soc. Trans.*, October, 1921, pp. 1683-1688.

ESSENTIAL OILS. The essential oil from *andropogon iwarancusa*, Jones, and the constitution of piperitone. J. L. Simonsen. *Chem. Soc. Trans.*, October, 1921, pp. 1644-1654.

SPECTROSCOPY. Recent applications of the spectroscope and the spectrophotometer to science and industry. S. J. Lewis. *J. Roy. Soc. Arts*; Part I., October 14, 1921, pp. 785-791; Part II., October 21, 1921, pp. 799-809; Part III., October 28, 1921, pp. 821-828.

United States

WATERPROOFING. Electrolytic waterproofing of textile fabrics: the Tate process. H. J. M. Creighton. *J. Franklin Inst.*, October, 1921, pp. 497-510.

ARSENIC COMPOUNDS. Aromatic arsenic compounds. Part IX. Diazoamino compounds of arsanilic acid and its derivatives. Part X. Azo dyes derived from arsanilic acid. W. A. Jacobs and M. Heidelberger. *J. Amer. Chem. Soc.*, July, 1921, pp. 1632-1654.

ESTERS. Preparation and hydrolysis of benzyl esters. E. H. Volwiler and E. B. Vliet. *J. Amer. Chem. Soc.*, July, 1921, pp. 1672-1676.

SILVER COMPOUNDS. Notes on silver bromate. J. H. Reedy. *J. Amer. Chem. Soc.*, July, 1921, pp. 1440-1445.

Chromo-isomeric silver salts of pentabromophenol and a theory of chromo-isomerism of solid compounds. H. J. Lucas and A. R. Kemp. *J. Amer. Chem. Soc.*, July, 1921, pp. 1654-1665.

REACTIONS. The action of hydrogen phosphide on formaldehyde. A. Hoffman. *J. Amer. Chem. Soc.*, July, 1921, pp. 1684-1688.

Addition reactions of the carbonyl group involving the increase in valency of a single atom. J. B. Conant. *J. Amer. Chem. Soc.*, July, 1921, pp. 1705-1714.

Addition reactions of phosphorus halides. Part II. The 1.4-addition of phosphenyl chloride. J. B. Conant and S. M. Pollack. *J. Amer. Chem. Soc.*, July, 1921, pp. 1665-1669.

Addition reactions of phosphorus halides. Part III. The reaction with dibenzal-acetone and cinnamylidene-acetophenone. J. B. Conant, A. H. Bump, and H. S. Holt. *J. Amer. Chem. Soc.*, July, 1921, pp. 1677-1684.

A reaction between methyl alcohol and water and some related reactions. J. A. Christiansen. *J. Amer. Chem. Soc.*, July, 1921, pp. 1670-1672.

ADDITION COMPOUNDS. The factors affecting the stability of addition compounds in solution and their influened upon ionization equilibria. Part I. J. Kendall and P. M. Gross. *J. Amer. Chem. Soc.*, July, 1921, pp. 1416-1426.

Compound formation and specific conductivity in solutions of the types acid-ester, acid-ketone, and acid-acid. J. Kendall and P. M. Gross. *J. Amer. Chem. Soc.*, July, 1921, pp. 1426-1439.

Compound formation and solubility in systems of the type formic acid-metal formate. J. Kendall and H. Adler. *J. Amer. Chem. Soc.*, July, 1921, pp. 1470-1481.

French

CYANAMIDE. The French cyanamide industry. H. Gall. *Chim. et Ind.*, October, 1921, pp. 430-439.

POTASH. The potash deposits of Alsace and the actual state of their exploitation. C. Matignon. *Chim. et Ind.*, October, 1921, pp. 440-464.

ANALYSIS. The scientific method and its application to analytical chemistry. H. Le Chatelier. *Chim. et Ind.*, October, 1921, pp. 423-429.

Rapid electro-analysis. A. Lassieur. *Bull. Soc. Chim.*, September 20, 1921, pp. 753-780.

Rapid method for estimating phosphoric acid. H. Copaux. *Compt. rend.*, October 17, 1921, pp. 656-658.

New method for the estimation of silica. M. Travers. *Compt. rend.*, October 24, 1921, pp. 714-717.

HYDROGEN. The manufacture of hydrogen by partial liquefaction of water gas. G. Claude. *Compt. rend.*, October 17, 1921, pp. 653-655.

PETROL. Petrol prepared from colza oil. A. Mailhe. *Compt. rend.*, October 17, 1921, pp. 658-660.

REDUCTION. The products of the reduction of dimethylcamphoramide. A. Haller and P. Ramart. *Compt. rend.*, October 24, 1921, pp. 682-685.

RESPIRATORS. Respirator for protection against carbon monoxide. A Desgrez, A. Guillemard, A. Hemmerdinger, and A. Labat. *Chim. et Ind.*, October, 1921, pp. 536-538.

PLASTIC MATERIALS. Some modern plastic materials. Part II. A. Hutin. Plastic materials with a basis of gelatine or organic waste products; miscellaneous materials. *Rev. Prod. Chim.*, October 31, 1921, pp. 621-628.

ALIZARIN. The dibromanthraquinone used in the synthesis of alizarin. M. Grandmougin. *Compt. rend.*, October 24, 1921, pp. 717-718.

PHYSICAL CHEMISTRY. Magneto-chemical investigation of inorganic structures. Part I. The sulphur acids. P. Pascal. *Compt. rend.*, October 24, 1921, pp. 712-714.

German

ELECTRO-CHEMISTRY. The electrolytic production of chlorine and alkali, and the apparatus employed. C. Tüschen. *Chem. Apparatur*, August 25, 1921, pp. 135-137.

The electrolysis of hot concentrated sulphuric acid. H. Hoffmann. *Z. Elektrochem.*, October 1, 1921, pp. 442-445.

CARBON. The fusion of carbon. E. Ryschkewitsch. *Z. Elektrochem.*, October 1, 1921, pp. 445-452.

COMBUSTION. Combustion of liquid fuels in motors, with particular reference to the analysis of the fuel and its gaseous products. Part II. F. Wehrmann. *Z. Elektrochem.*, October 1, 1921, pp. 423-441.

CATALYSIS. The catalytic hydrogenation of organic compounds with base metals at ordinary temperature. The influence on the removal of the halogen by catalytic hydrogenation of the kind and position of the halogen in organic halogen compounds. C. Kelber. *Ber.*, October 15, 1921, pp. 2255-2260.

CONDENSATION. Sulpho-acetic acid as condensing agent. Part II. Synthesis of *sym.* tri-*p*-anisyl-benzene from anisol. W. Schneider and F. Seebach. *Ber.*, October 15, 1921, pp. 2298-2302.

FLUORESCENCE. A relation between the fluorescence and the chemical constitution of benzoxazole derivatives. F. Henrich. *Ber.*, October 17, 1921, pp. 2492-2511.

TRIVALENT CARBON. A new class of compounds with trivalent carbon. Part I. R. Scholl. *Ber.*, October 17, 1921, pp. 2376-2388.

Patent Literature

Abstracts of Complete Specifications

169,460. DYESTUFFS OF THE ACRIDINE SERIES, MANUFACTURE OF. Akt.-Ges. für Anilin Fabrikation, Berlin-Treptow, Germany. International Convention date, April 22, 1915.

Specification 145,802 (see THE CHEMICAL AGE, Vol. III., p. 294) describes the manufacture of dyestuffs of the acridine series by heating together a formyl derivative of a metadiamine of the benzene series and a monoalkylated or unsymmetrically dialkylated metadiamine of the benzene series, or, alternatively, a formyl derivative of a monoalkylated or unsymmetrically dialkylated metadiamine of the benzene series and a metadiamine of the benzene series or a monoalkylated or unsymmetrically dialkylated metadiamine of the benzene series. In the present invention 2-naphthylamine is used for one of the bases needed for the formation of the acridine derivative. The reaction is conducted with salts of the bases in question such that there is at least one molecular proportion of acid present for the formation of one molecular proportion of the dyestuff. Several examples are given in detail.

170,022. CATALYTIC OXIDATION PROCESSES. J. M. Selden and The Selden Co., 810, House Building, Pittsburgh, Pa., U.S.A. Application date, April 7, 1920.

The process is for improving the efficiency of vanadium pentoxide when used as a catalyst in oxidation processes such as the manufacture of sulphur trioxide and the oxidation of hydrocarbons and lower oxidation products of these. It is found that the efficiency is improved if the vanadium pentoxide is heated above 500°C. The oxide first darkens in colour and becomes crystalline, then sinters, and finally fuses. Ammonium metavanadate is heated to about 300°C. to produce the pentoxide, which is then heated to fusion point (658°C.), allowed to cool, and then broken up. The following examples indicate the use of the catalyst: (1) A mixture of sulphur dioxide and air is passed over the catalyst at 400°C. with the formation of sulphur trioxide. (2) A mixture of methane and an excess of air is passed over the catalyst at 300°C., formaldehyde being produced. (3) Benzene vapour and air are passed over the catalyst at 350°-400°C., and quinone and maleic acid are produced. (4) Anthracene vapour is oxidised at about 500°C. yielding anthraquinone. (5) Toluene vapour is oxidised at about 200°—400°C. yielding benzaldehyde and benzoic acid. (6) *o*-, *m*- or *p*-xylene yield substituted benzaldehydes or benzoic acids. (7) *p*-cymene or phenanthrene are oxidised to quinones. (8) Naphthalene is oxidised at 400°C. to phthalic anhydride. The yield of these oxidation products may be increased by about 25 per cent. by the use of the sintered or fused vanadium pentoxide.

170,056. CHLORINATED DERIVATIVES OF TOLUENE, MANUFACTURE OF. British Dyestuffs Corporation, Ltd., Imperial House, Kingsway, London, W.C.2. and A. G. Green and A. E. Herbert, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, June 15, 1920.

The process is more particularly for the chlorination of toluene-orthosulphonic acid, and it is found that under suitable conditions the acid or its soluble salts may be chlorinated in aqueous solution to 4-chloro- and 6-chloro-derivatives, which may then be separated and hydrolysed to yield para- and ortho-chloro-toluenes. If the original solution is more dilute or the temperature higher during chlorination, a mixture of dichloro-toluene-*o*-sulphonic acids is obtained, and, finally, a mixture of tri-chloro-derivatives, from which pure 2 : 4 : 5-tri-chloro-toluene may be obtained by hydrolysis. The separation of the constituents of the mixtures obtained as above is effected by taking advantage of the differences in their solubilities. It is found that sufficient water must be present to maintain the bodies in solution till they are sufficiently chlorinated, and that higher chlorination is obtained by raising the temperature and thus increasing the solubility of these bodies. A higher temperature also has the effect of reducing the solubility of chlorine and thus renders the reaction slower. The mono- and tri-chloro-toluene sulphonic acids and the chlorinated toluenes obtained by hydrolysis may be oxidised to the corresponding derivatives of benzaldehyde, which are applicable for the manufacture of triaryl-methane dyestuffs. Detailed examples are given.

170,082. ZINC OXIDE SUITABLE FOR METALLURGICAL TREATMENT, PRODUCTION OF. A. Mond, London. (From Metallbank und Metallurgische Gesellschaft, Akt.-Ges., 45, Bockenheimer Anlage, Frankfurt-on-Main, Germany.) Application date, July 9, 1920.

The object is to obtain from liquor containing zinc sulphate, zinc oxide substantially free from sulphur. When such a solution is treated with milk of lime at 20°C. the precipitate contains about 40 per cent. of gypsum, but when the mixture is heated in the presence of sodium and/or calcium chloride, insoluble basic zinc sulphate and soluble calcium chloride are produced. Instead of sodium or calcium chloride, a concentrated solution of zinc chloride may be added. The conditions necessary for the reaction are a high concentration of the solution, a high temperature, and continuous stirring. As an alternative, the production of the pure zinc oxide may be effected in one operation. The zinc sulphate liquor is mixed with sodium and/or calcium chloride, heated to about 70°C. and thin milk of lime then slowly added.

170,093. OILS AND OTHER HYDROCARBONS, PURIFICATION OF. M. Benson, La Salle Hotel, Chicago, Ill., U.S.A. Application date, July 10, 1920.

The process is for treating crude or unrefined petroleum products containing sulphur with reagents which form non-volatile products with the sulphur, and instantaneously vaporising the volatile hydrocarbons to separate them from the sulphur compounds. The crude oil is treated with slaked lime either cold or near the boiling-point, and then intimately mixed with superheated steam. The mixture is then transferred to a still containing mechanically-agitated slaked lime. The steam is at about 100 lb. per sq. in. and is in such amount as to effect substantially simultaneous vaporisation of the volatile constituents. The vaporisation may be effected by discharging the mixture into a vessel at reduced pressure.

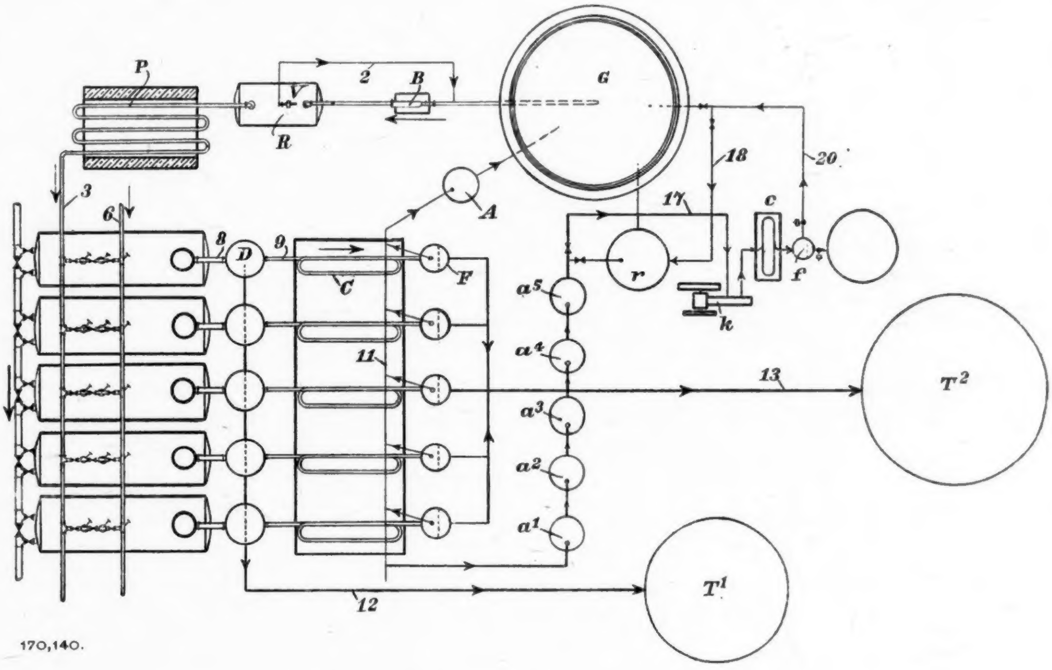
170,100. ORES, ROASTER-RESIDUES, SLAGS AND THE LIKE CONTAINING IRON AND ZINC, PREPARATION AND SMELTING OF. L. H. Diehl, 141, Heinrichstrasse, Darmstadt, Germany. Application date, July 12, 1920.

When zinc-bearing iron ores, residues, &c., are smelted in blast furnaces, metallic zinc is volatilised and subsequently condenses in the cooler parts of the furnace, giving rise to obstructions. The object is to obtain the zinc as a volatile compound which is not liable to condense near the furnace. The raw material is first desulphurised and then sintered or briquetted, if necessary. The material is then smelted with the usual reducing and fluxing agents, and also a chloride such as an alkali or alkaline earth chloride, or zinc chloride. The zinc is thereby volatilised as chloride or oxychloride, which is carried out of the furnace with the gas, while the iron and slag remain practically free from zinc. The zinc is recovered partly in the flue dust and partly in the gas-washing plant, so that a clean combustible gas is also obtained. The zinc content of the slag may be reduced to about 0.1 per cent. The amount of chloride used may be about 2 atoms of combined chlorine to 1 atom of zinc. Less than this quantity may be used, in which case some zinc oxide will be volatilised with the chloride. The crude precipitate in the gas washers is calcined to remove volatile and combustible impurities and to densify it. This process is particularly suitable for treating the residues obtained from pyrites containing zinc. The residue is crushed and roasted with a limited quantity of air, so that about one-fourth of the ferric oxide is reduced to ferrous oxide. The product is thus rendered more fusible and becomes sintered during desulphurisation, which is carried on until the sulphur content is reduced to 0.5 per cent. The chloride which remains as a solution in the wash water is recovered for fresh operations in the blast furnace.

170,140. DISTILLATION OF HYDROCARBON OILS, ASPHALTS AND THE LIKE. E. F. Engelke, Tampico, Tamaulipas, Mexico. Application date, July 27, 1920.

The object is to effect a continuous distillation of hydrocarbon oils, such as Mexican crude oils, so as to obtain a larger yield of light distillates. The process makes use of the property of gases containing hydrogen of producing a rapid evaporation of the oil and a higher yield of low boiling hydro-

carbons of a saturated nature. Gas containing hydrogen is drawn from a reservoir G by a blower B and delivered to a receiver R provided with a relief valve V and a return pipe 2. The gas then passes through a tubular preheater P and pipe 3 to a battery of stills containing the oil, which is maintained at boiling-point by a furnace. The gas is supplied to the stills through branch pipes, and is delivered below and above the surface of the oil. In order to raise the flash point of the oil, steam is also supplied through a pipe 6 to any or all of the stills. The vapour and gas pass through pipes 8 to dephlegmators D, where the heavier fractions are separated. The lighter fractions pass through pipes 9 to water-cooled condensers C, and the condensate is separated in traps F. The residual gas from the latter passes to a gas main 11, and thence to a vessel A containing a gas oil having a high initial boiling-point, which absorbs the residual light gasolene from the gas. The gasolene is subsequently recovered by steam distillation. The gas is then returned to the reservoir G for use again. Instead of the single vessel A, a number of connected vessels, a^1, a^2, a^3, a^4, a^5, may be used containing substances for chemically treating the gas. The vessels a^1, a^2 may contain concentrated sulphuric acid, vessel a^3 may contain water, vessel a^4 may contain an alkaline solution or any other desulphurizing substance, and the vessel a^5 may contain water. These vessels are kept at a sufficiently high temperature to prevent condensation of the gasolene. Gaseous mixture is drawn through a pipe 17 and compressor k and delivered to a cooler c, and the condensed gasolene collected in a trap f. Alternatively, the gasolene may be absorbed in a vessel r. In either case, the residual gas is returned through pipes 18 or 20 to the reservoir G. The heavy fractions precipitated in the dephlegmators D pass through a pipe 12 to a tank T^1 and the lighter fractions pass through pipe 13 to the tank T^2.



170,140.

170,152. Desulphurizing Gases, Process for. J. Y. Johnson, London. (Badische Anilin and Soda Fabrik, Ludwigshafen-on-Rhine, Germany.) Application date, August 4, 1920.

When coal gas is treated with a catalytic substance for the removal of its sulphur compounds, it is found that the catalytic substance soon loses its efficiency. The process is for preventing this loss of efficiency by subjecting the gas to a preliminary purification. The gas is passed through a washing liquid such as concentrated sulphuric acid of 82 per cent. strength, or through a porous substance such as charcoal. This removes tarry substances which would interfere with the subsequent removal of the sulphur compounds, while ethylene and sulphur compounds are not affected. The gas is then passed through a vessel containing active charcoal, into which sufficient oxygen or air is introduced for the oxidation of the sulphuretted hydrogen. Sulphur is deposited on the charcoal and may be subsequently extracted by a suitable solvent or otherwise removed. If the gas was purified by means of acid, a small amount of ammonia or ammonium carbonate may be added before treatment with the charcoal, or may be added to the charcoal. A single purification vessel containing acid may be combined with one or more vessels containing charcoal, or *vice versa*.

170,155. Chromium Lakes of Azodyes, Manufacture of Soluble. W. Carpmael, London. (From Farbenfabriken vorm. F. Bayer & Co., Leverkusen, near Cologne, Germany.) Application date, August 11, 1920.

Diazotised anthranilic acid or a derivative not containing hydroxyl groups is coupled with β-naphthyl-amine sulphonic acids and the products are heated with chromium compounds to convert them into their soluble chromium derivatives. Alternatively, anthranilic sulphonic acids such as C_6H_3 (COOH) : (NH_2) : $(SO_3H) = 1 : 2 : 5$ or C_6H_3 (COOH) : (NH_2) : $(SO_3H) = 1 : 2 : 4$ are coupled with β-naphthyl-amine or its sulphonic acids and then treated as above. In an example, anthranilic acid is diazotized as usual and combined with 2-naphthyl-amine-7-sulphonic acid, with the addition of sodium acetate. The dyestuff is isolated by adding salt, and its solution is boiled with chromium fluoride. The solution becomes reddish-violet, and is then filtered, and the chromium compound salted out and dried. Insoluble colour lakes (barium, calcium and aluminium) may then be obtained in the usual manner. As alternatives to the anthranilic acid, chloro or nitro-anthranilic acids, such as C_6H_3 (COOH) : (NH_2) : $(Cl) = 1 : 2 : 4$, C_6H_3 (COOH) : (NH_2) : $(NO_2) = 1 : 2 : 5$ or C_6H_3 (COOH) : (NH_2) : $(NO_2) = 1 : 2 : 4$ may be used. As alternatives to the 2 : 7-naphthyl-amine sulphonic acid, 2-naphthyl-amine-di-or trisulphonic acids may be used, or β-naphthyl-amine may be combined with sulpho-anthranilic acids.

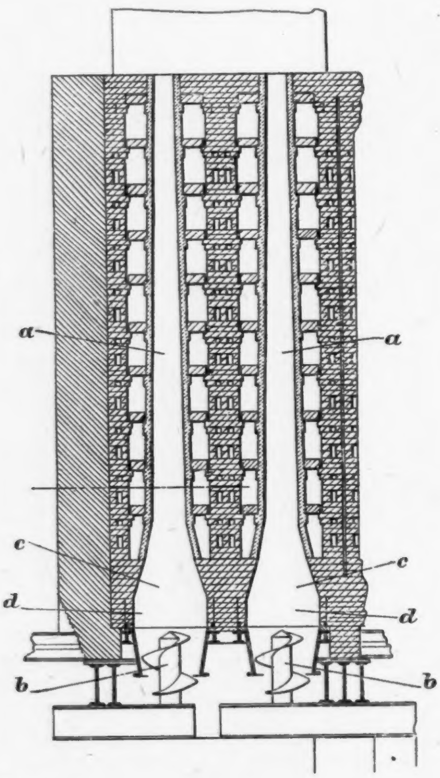
170,185. Alkali Formates, Manufacture of. G. C. Bacon, 70-72, Chancery Lane, London, W.C.2. (From Oldbury Electro Chemical Co., Niagara Falls, N.Y., U.S.A.). Application date, September 17, 1920.

The process is for producing alkali formates by absorbing carbon monoxide under heat and pressure in caustic alkalies.

It is now found that the process may be rendered more economical by replacing the caustic alkali by the corresponding carbonate, such as sodium carbonate, and an equivalent amount of an earth metal hydroxide such as lime. The mixture is treated with carbon monoxide under a pressure of 70-100 lb. per sq. in. at a temperature above 100°C. Calcium carbonate is precipitated and filtered off.

170,197. VERTICAL RETORTS FOR THE CONTINUOUS DESTRUCTIVE DISTILLATION OF CARBONACEOUS MATERIAL. S. Glover, Olive Mount, St. Helens, Lancs, J. West, Alton Lodge, Park Crescent, Southport, Lancs, and West's Gas Improvement Co., Ltd., Albion Works, Miles Platting, Manchester. Application date, October 16, 1920.

A vertical retort for the production of water gas is constructed so that the incandescent coke at the point where the steam is injected into the retort is in such a form as to ensure the rapid conversion of the steam into water gas. Each retort



170,197.

a is of elliptical cross section and is provided with a helical extractor *b*, which supports the column of coal in the retort and extracts the coke at the bottom. The base of the retort widens gradually to form a chamber *c*, so that the part *d* preferably assumes a circular form. This enlargement of the retort by which the lateral support of the coke is withdrawn, combined with the effect of the extractor *b*, breaks up the coke in such a manner that the steam which is introduced at the bottom is compelled to follow a very tortuous path.

NOTE.—Abstracts of the following specifications which are now accepted appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention: 144,614 (Barrett Co.) relating to controlling the temperature of chemical reactions, *see* Vol. III., p. 213; 145,610 (F. Moeller) relating to cellulose and products therefrom, *see* Vol. III., p. 293; 147,415 (Zellstofffabrik Waldhof and V. Hottenroth) relating to sugar from wood, *see* Vol. III., p. 429; 147,474-6-147,488 (G. Schroeter) relating to hydrogenation of naphthalene, *see* Vol. III., p. 429; 147,578 (E. Sittig and A. Granichstadten) relating to hydrogenation and catalysts, *see* Vol. III., p. 429; 147,580-747 (Tetralin Ges.) relating to hydrogenation of naphthalene, *see* Vol. III., pp. 429, 430; 148,111 (C. & G. Muller Speisefettfabrik Akt.-Ges.) relating to metallic non-pyrophoric catalysts, *see* Vol. III., p. 455.

International Specification not yet Accepted

169,428. LIQUID FUELS. Akt.-Ges. fur Anilin Fabrikation, Treptow, Berlin. International Convention date, September 20, 1920.

A motor fuel is composed of a cyclohexane such as methyl cyclohexane 50-70 parts, and a hydronaphthalene such as tetrahydronaphthalene 50-30 parts. Dimethyl-cyclohexane and deca-hydronaphthalene may also be used as alternatives.

LATEST NOTIFICATIONS

171,074. Catalytic process for obtaining reactions between a gas and another substance, and apparatus for carrying out said process. Slatineanu, E. November 5, 1920.
171,075. Distillation of oils. Trent Process Corporation. November 4, 1920.
171,078. Manufacture of stable, dry, and readily soluble vat preparations for dyeing. Farbwerke Vorm, Meister, Lucius, & Bruning. November 1, 1920.
171,081. Production of plastic masses and so forth from smokeless powder. Deutsche Sprengstoff-Akt. Ges. November 2, 1920.
171,084. Process for the manufacture of soaps of all kinds. Plausons Forschungsinstitut Ges. November 3, 1920.
171,094. Manufacture of condensation products. Pollak, F. November 3, 1920.

Specifications Accepted, with Date of Application

145,055. Trisazo dyestuffs capable of being diazotised, Manufacture of. Akt.-Ges. für Anilin Fabrikation. June 29, 1915.
145,522. Sulphurised dyestuffs, Manufacture of. Akt.-Ges. für Anilin Fabrikation. January 21, 1914.
149,354. Azo dyes and their process of manufacture. R. Arnot. May 7, 1917.
149,974. Converting combustible substances into soluble organic compounds, Processes for. R. Fischer. June 10, 1919.
155,297. Furnace electrodes of large cross section, Process for the manufacture of. Ges. für Teerverwertung. November 27, 1919.
157,155. Oil from oil seeds and the like, Extraction of. P. L. Fauth (Firm of). June 5, 1919.
160,810. Fertilisers, Manufacture of. Soc. L'Azote Français. March 29, 1920.
163,023. Rabble stones for roasting furnaces. Rheinisch-Nassauische Bergwerks und Hütten Akt.-Ges. W. Hocks and G. Stohn. May 5, 1920.
170,613. Ammonium sulphate, Manufacture of. South Metropolitan Gas Co., and P. Parrish. April 30, 1920.
170,617. Heating liquids by introduction into molten metal. Thermal Industrial and Chemical (T. I. C.) Research Co., Ltd., Sir A. M. Duckham and J. S. Morgan. May 26, 1920.
170,682. Caoutchouc and caoutchouc-like products, Manufacture of. P. Schidrowitz, and Catalpo, Ltd. July 28, 1920.
170,743. Charging and discharging gas retorts and the like, Apparatus for. C. Hollander. March 21, 1921.
170,764. Shaft furnaces for burning cement magnesite and similar substances. A. Hauenschild. October 25, 1920.
170,781. Soap, Manufacture of. J. Tseng. December 9, 1920.
170,788. Vacuum Filtration Apparatus. A. T. Cartner, R. Clewer and Mather & Platt, Ltd. January 21, 1921.

Applications for Patents

British Dyestuffs Corporation, Ltd. McLeod, C. M. & Chemo, G.R. Mono-nitro! and mono-amino derivatives of *p*-halogenated-dialkylanilines. 29,902. November 9.
British Dyestuffs Corporation, Ltd. & McLeod, C. M. Dye-stuffs from by-products obtained in manufacture of dialkyl rhodamines. 30,264. November 12.
Chemicals & By-Products, Ltd. Indicator for determining weak acids or bases in the presence of strong acids and bases, &c. 30,119. November 11.
Chemische Fabrik Griesheim-Elektron. Production of carbon disulphide from its elements. 29,835. November 9. (Germany, January 14.)
Dreyfus, H. Manufacture of cellulose derivatives. 29,735. November 8.
Hughes, A. W. & Teague, F. C. Process for fixation of atmospheric nitrogen. 30,124. November 11.
Geddes, C. A. Apparatus for carbonating and dispensing liquids. 30,103. November 11.
Green, A. G. Dye-stuffs from by-products obtained in manufacture of dialkylrhodamines. 30,264. November 12.
Laing, B. Distillation, &c., of carbonaceous materials. 30,032. November 10.

Monthly Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, *and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.*

British Market Report

LONDON, November 17, 1921.

There is a definite but slow improvement in the demand for chemicals, and prices are well maintained. Continental suppliers on the whole ask more money for their goods, and the whole situation is healthier than has been the case for some considerable time.

The export demand has slackened off for the moment, and whilst there is considerable inquiry only a small business is actually passing.

General Chemicals

ACETONE is particularly firm, and supplies are scarce.

ACID ACETIC.—Several re-sale parcels have been offered by weak holders, but the undertone is satisfactory.

ACID CITRIC is unchanged.

ACID FORMIC is only in slow demand; prices are maintained.

ACID OXALIC is intrinsically dearer, but the demand is poor.

ACID TARTARIC remains uninteresting.

ARSENIC continues in good demand, and the price is buoyant.

BICHROMATES.—There is a steady demand of rather small dimensions, and the price is steady.

BLEACHING POWDER is unchanged.

COPPER SULPHATE is slow and uninteresting.

FORMALDEHYDE.—There is no change in price to record; stock passes freely into consumption.

IRON SULPHATE is unchanged.

LEAD ACETATE is only a nominal market, and the tendency favours buyers.

LEAD NITRATE.—There is an almost entire lack of inquiry; the price is nominal.

LITHOPONE is in fair demand, but the turnover is disappointing; price seems to have touched the bottom.

POTASSIUM CARBONATE is again lower in price, and the tendency remains downwards.

POTASSIUM CAUSTIC is only a nominal market, with practically no demand.

POTASSIUM CHLORATE has had rather a better tendency, and several transactions have been done, but at very low prices.

POTASSIUM PRUSSIATE is a firm market; stocks are small, but equal to the demand.

SODIUM ACETATE is in poor demand, but the price is firm and tends upwards.

SODIUM CAUSTIC.—The active export demand continues, and in many cases buyers' limits are now too low.

SODIUM NITRATE.—Only a nominal business is passing.

SODIUM PHOSPHATE is unchanged.

SODIUM PRUSSIATE is very firm, and a steady business is reported.

Coal Tar Intermediates

Business during the past week has continued on quiet lines, and buyers hesitate to cover more than their immediate needs. A certain export inquiry has been received, and this market may be more interesting before long, since Continental supplies of some intermediates seem to be rather short.

ALPHA NAPHTHYLAMINE shows a steady quiet business, with the price unchanged.

ANILINE OIL AND SALT are very firm, and re-sale parcels seem to be practically cleared up.

BENZIDINE BASE has received some small attention.

BETA NAPHTHOL is slightly more interesting than of late, but prices remain unchanged.

DIMETHYLANILINE continues in fairly short supply.

DIPHENYLAMINE is in demand at last quoted price.

"H" ACID is a quiet easy market.

NITRO BENZOL is steady, and orders have been received within the usual home trade limits. This intermediate has also been in export demand.

PARANITRANILINE has been inquired for.

RESORCIN is uninteresting.

Coal Tar Products

Although conditions remain somewhat depressed the general tone of the market for coal tar products seems to have improved slightly during the week, creosote oil being the one exception.

90 PER CENT. BENZOL remains fairly firm at 2s. 7d. on rails in the Midlands, and 2s. 10d. to 3s. in the South.

PURE BENZOL is difficult to obtain, and business has been done at 3s. 6d. to 3s. 8d. on rails in the Midlands and 4s. in London.

CREOSOTE OIL is somewhat weaker and is worth about 6½d. to 7d. in the North and 7½d. in the South.

CRESYLIC ACID is worth 2s. 2d. on rails for the Pale quality 97-99 per cent., while Dark is worth about 1s. 10d. to 2s. Prices appear to be fairly steady at about these figures.

SOLVENT NAPHTHA is rather more plentiful, and is quoted 2s. 6d. to 2s. 7d. on rails in the Midlands and 2s. 11d. to 3s. in London.

NAPHTHALENE is worth from £5 to £8 per ton f.o.r. for the Crude qualities, while Refined are worth from £16 to £18 per ton.

PITCH.—The market is weak and prices still have a downward tendency. To-day's values are approximately 50s. f.o.b., London, 47s. 6d., f.o.b., East Coast, and 45s. f.o.b., West Coast.

Sulphate of Ammonia

The position is unchanged. The demand remains satisfactory, and prices are well maintained.

French Market Report

Trade continues along quiet lines, but the market shows a firmer undertone. The following may be taken as the general ruling quotations:

ACETONE, 550 frs.
ACID ACETIC, 80 per cent., 210 frs.
ACID BORACIC, 330 frs.
ACID LACTIC, 50 per cent., 250 frs.
ACID OXALIC, 430 frs.
ALUM CHROME, 170 frs.
ALUMINA SULPHATE, 14 per cent., 70 frs.
ALUMINA SULPHATE, 17-18 per cent., 85 frs.
AMMONIA ALUM, 105 frs.
BLEACHING POWDER, 70 frs.
BORAX CRYSTALS, 165 frs.
CALCIUM CHLORIDE, 43 frs.
COPPER SULPHATE, 130 frs.
IRON SULPHATE, 28 frs.
LITHOPONE, 150 frs.
PEROXIDE OF HYDROGEN, 110 frs.
POTASSIUM BICHROMATE, 365 frs.
POTASSIUM METABISULPHITE, 500 frs.
POTASSIUM PERMANGANATE, 1,000 frs.
POTASSIUM PRUSSIATE YELLOW, 600 frs.
POTASSIUM PRUSSIATE RED, 1,400 frs.
SODIUM ARSENIATE, 200 frs.
SODIUM BICARBONATE, 100 frs.
SODIUM BICHROMATE, 310 frs.
SODIUM BISULPHITE, 60 frs.
SODIUM HYPOSULPHITE, 85 frs.
SODIUM NITRITE, 330 frs.
SODIUM PRUSSIATE, 300 frs.
SODIUM SILICATE, 65 frs.
SODIUM SULPHIDE CRYSTALS, 75 frs.
SODIUM SULPHIDE CONCENTRATED, 140 frs.
ZINC CHLORIDE, 55 frs.
All the above are per 100 kilos.

German Market Report

There has been very considerable activity since the date of our last report, and prices have strongly advanced in sympathy with the fall in the value of the mark.

Many works are fully sold ahead, and there is difficulty in securing supplies for prompt delivery. The following are the chief quotations :

ACID BORACIC, 40 marks.
ACID OXALIC, 33 marks.
ACID TARTARIC, 70 marks.
ALUM CHROME, 10 marks.
AMMONIA ALUM, 4.25 marks.
AMMONIA CARBONATE, 7 marks.
BLEACHING POWDER, 360 marks per 100 kilos.
BORAX, 20 marks.
COPPER SULPHATE, 15 marks.
LITHOPONE, 8 marks.
POTASSIUM CAUSTIC SOLID, 18 marks.
POTASSIUM BICHROMATE, 55 marks.
POTASSIUM NITRATE, 10 marks.
POTASSIUM PERMANGANATE, 35 marks.
POTASSIUM PRUSSIATE YELLOW, 56 marks.
SODIUM HYPOSULPHITE, 8 marks.
All the above prices are per kilo., unless otherwise stated.

Current Prices

Chemicals

	per	£	s.	d.		£	s.	d
Acetic anhydride	lb.	0	2	1	to	0	2	2
Acetone oil	ton	87	10	0	to	90	0	0
Acetone, pure	ton	90	0	0	to	95	0	0
Acid, Acetic, glacial, 99-100%	ton	60	10	0	to	62	10	0
Acetic, 80% pure	ton	45	0	0	to	48	0	0
Arsenic	ton	95	0	0	to	100	0	0
Boric, cryst	ton	65	0	0	to	68	0	0
Carbolic, cryst. 39-40%	lb.	0	0	6½	to	0	0	7
Citric	lb.	0	2	5	to	0	2	6
Formic, 80%	ton	65	0	0	to	67	10	0
Gallic, pure	lb.	0	3	10	to	0	4	0
Hydrofluoric	lb.	0	0	8½	to	0	0	9
Lactic, 50 vol.	ton	40	0	0	to	43	0	0
Lactic, 60 vol.	ton	43	0	0	to	45	0	0
Nitric, 80 Tw.	ton	38	0	0	to	40	0	0
Oxalic	lb.	0	0	8½	to	0	0	9
Phosphoric, 1.5	ton	45	0	0	to	47	0	0
Pyrogallic, cryst	lb.	0	7	6	to	0	7	9
Salicylic, Technical	lb.	0	1	2	to	0	1	3
Salicylic, B.P.	lb.	0	1	6	to	0	1	8
Sulphuric, 92-93%	ton	8	0	0	to	8	10	0
Tannic, commercial	lb.	0	3	6	to	0	3	9
Tartaric	lb.	0	1	5	to	0	1	6
Alum, lump	ton	18	0	0	to	18	10	0
Alum, chrome	ton	37	10	0	to	40	0	0
Alumino ferric	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15%	ton	12	0	0	to	13	0	0
Aluminium, sulphate, 17-18%	ton	15	0	0	to	16	0	0
Ammonia, anhydrous	lb.	0	1	10	to	0	2	0
Ammonia, .880	ton	35	0	0	to	37	0	0
Ammonia, .920	ton	22	0	0	to	24	0	0
Ammonia, carbonate	lb.	0	0	4	to		—	
Ammonia, chloride	ton	60	0	0	to	65	0	0
Ammonia, muriate (galvanisers)	ton	45	0	0	to	47	10	0
Ammonia, nitrate	ton	55	0	0	to	60	0	0
Ammonia, phosphate	ton	90	0	0	to	95	0	0
Ammonia, sulphocyanide	lb.	0	3	0	to	0	3	0
Amyl acetate	ton	150	0	0	to	160	0	0
Arsenic, white, powdered	ton	42	0	0	to	44	0	0
Barium, carbonate, 92-94%	ton	12	10	0	to	13	0	0
Barium, chlorate	lb.	0	0	11	to	0	1	0
Chloride	ton	15	0	0	to	16	0	0
Nitrate	ton	42	10	0	to	45	0	0
Barium Sulphate, blanc fixe, dry	ton	26	0	0	to	28	0	0
Sulphate, blanc fixe, pulp	ton	16	0	0	to	16	10	0
Sulphocyanide, 95%	lb.	0	1	6	to	0	1	0
Bleaching powder, 35-37%	ton	14	0	0	to		—	
Borax crystals	ton	31	0	0	to	32	0	0
Calcium acetate, Brown	ton	8	0	0	to	9	0	0
,, ,, Grey	ton	10	0	0	to	11	0	0
Calcium Carbide	ton	22	0	0	to	23	0	0
Chloride	ton	8	10	0	to	9	0	0
Carbon bisulphide	ton	60	0	0	to	62	0	0
Casein, technical	ton	85	0	0	to	90	0	0
Cerium oxalate	lb.	0	3	6	to	0	3	9
Chromium acetate	lb.	0	1	1	to	0	1	3
Cobalt acetate	lb.	0	11	0	to	0	11	6
Oxide, black	lb.	0	10	6	to	0	11	0
Copper chloride	lb.	0	1	3	to	0	1	6
Sulphate	ton	29	10	0	to	30	10	0
Cream Tartar, 98-100%	ton	130	0	0	to	135	0	0
Epsom salts (*see* Magnesium sulphate)								
Formaldehyde 40% vol.	ton	88	0	0	to	90	0	0
Formusol (Rongalite)	lb.	0	3	9	to	0	4	0
Glauber salts, commercial	ton	5	5	0	to	5	10	0
Glycerine, crude	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols.	gal.	0	2	8	to	0	2	9
Iron perchloride	ton	35	0	0	to	40	0	0
Iron sulphate (Copperas)	ton	4	0	0	to	4	5	0
Lead acetate, white	ton	48	0	0	to	50	0	0
Carbonate (White Lead)	ton	43	0	0	to	46	0	0
Nitrate	ton	48	10	0	to	50	10	0
Litharge	ton	35	10	0	to	36	0	0
Lithopone, 30%	ton	26	0	0	to	28	0	0
Magnesium chloride	ton	12	0	0	to	13	0	0
Carbonate, light	cwt.	2	10	0	to	2	15	0
Sulphate (Epsom salts commercial)	ton	9	10	0	to	10	0	0
Sulphate (Druggists')	ton	15	10	0	to	17	10	0
Manganese, Borate	ton	70	0	0	to	75	0	0
Sulphate	ton	70	0	0	to	75	0	0
Methyl acetone	ton	85	0	0	to	90	0	0
Alcohol, 1% acetone	ton	105	0	0	to	110	0	0
Nickel sulphate, single salt	ton	65	0	0	to	66	0	0
Nickel ammonium sulphate, double salt	ton	67	0	0	to	68	0	0
Potash, Caustic	ton	33	0	0	to	33	10	0
Potassium bichromate	lb.	0	0	7¾	to		—	
Carbonate, 90%	ton	31	0	0	to	33	0	0
Chloride 60%	ton	15	0	0	to	20	0	0
Chlorate	lb.	0	0	5	to	0	0	5½
Meta bisulphite, 50-52%	ton	120	0	0	to	125	0	0
Nitrate, refined	ton	45	0	0	to	47	0	0
Permanganate	lb.	0	1	2	to	0	1	4
Prussiate, red	lb.	0	2	4	to	0	2	6
Prussiate, yellow	lb.	0	1	2½	to	0	1	3
Sulphate, 90%	ton	20	0	0	to	22	0	0

Coal Tar Intermediates, &c.

	Per	£	s.	d.		£	s.	d.
Alphanaphthol, crude	lb.	0	3	3	to	0	3	6
Alphanaphthol, refined	lb.	0	3	9	to	0	4	0
Alphanaphthylamine	lb.	0	2	6	to	0	2	8
Aniline oil, drums extra	lb.	0	1	5	to	0	1	6
Aniline salts	lb.	0	1	6	to	0	1	7
Anthracene, 40-50%	unit	0	0	8½	to	0	0	9
Benzaldehyde (free of chlorine)	lb.	0	3	6	to	0	3	9
Benzidine, base	lb.	0	6	0	to	0	6	6
Benzidine, sulphate	lb.	0	6	6	to	0	7	0
Benzoic acid	lb.	0	2	0	to	0	2	3
Benzoate of soda	lb.	0	2	0	to	0	2	3
Benzyl chloride, technical	lb.	0	2	0	to	0	2	6
Betanaphthol benzoate	lb.	0	5	9	to	0	6	3
Betanaphthol	lb.	0	2	3	to	0	2	0
Betanaphthylamine, technical	lb.	0	9	0	to	0	9	6
Croceine Acid, 100% basis	lb.	0	4	6	to	0	5	6
Dichlorbenzol	lb.	0	0	9	to	0	0	10
Diethylaniline	lb.	0	6	9	to	0	7	0
Dinitrobenzol	lb.	0	1	5	to	0	1	6
Dinitrochlorbenzol	lb.	0	1	5	to	0	1	6
Dinitronaphthaline	lb.	0	1	6	to	0	1	8
Dinitrotoluol	lb.	0	1	8	to	0	1	9
Dinitrophenol	lb.	0	2	9	to	0	3	[illegible]
Dimethylaniline	lb.	0	3	9	to	0	4	[illegible]
Diphenylamine	lb.	0	4	6	to	0	4	9
H-Acid	lb.	0	8	0	to	0	8	6
Metaphenylenediamine	lb.	0	5	6	to	0	5	9
Monochlorbenzol	lb.	0	0	10	to	0	1	0
Metanilic Acid	lb.	0	6	6	to	0	7	0
Monosulphonic Acid (2.7)	lb.	0	7	0	to	0	7	6
Naphthionic acid, crude	lb.	0	4	0	to	0	4	3
Naphthionate of Soda	lb.	0	4	3	to	0	4	6
Naphthylamin-di-sulphonic-acid	lb.	0	4	9	to	0	5	0
Nitronaphthalene	lb.	0	1	4	to	0	1	5
Nitrotoluol	lb.	0	1	3	to	0	1	4
Orthoamidophenol, base	lb.	0	18	0	to	1	0	0
Orthodichlorbenzol	lb.	0	1	1	to	0	1	2
Orthotoluidine	lb.	0	2	3	to	0	2	6
Orthonitrotoluol	lb.	0	0	10	to	0	1	0
Para-amidophenol, base	lb.	0	12	0	to	0	12	6
Para-amidophenol, hydrochlor	lb.	0	12	6	to	0	13	0
Paradichlorbenzol	lb.	0	0	7	to	0	0	8
Paranitraniline	lb.	0	4	6	to	0	4	9
Paranitrophenol	lb.	0	2	9	to	0	3	0
Paranitrotoluol	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled	lb.	0	12	0	to	0	13	0
Paratoluidine	lb.	0	7	0	to	0	7	6
Phthalic anhydride	lb.	0	3	9	to	0	4	0
Resorcin, technical	lb.	0	5	0	to	0	5	6
Resorcin, pure	lb.	0	8	0	to	0	8	6
Salol	lb.	0	2	6	to	0	2	9
Sulphanilic acid, crude	lb.	0	1	4	to	0	1	6
Tolidine, base	lb.	0	6	6	to	0	7	0
Tolidine, mixture	lb.	0	2	6	to	0	2	9

	Per	£	s.	d.		£	s.	d.
Salammoniac, firsts	cwt.	3	5	0	to	—		
Seconds	cwt.	3	0	0	to	—		
Sodium acetate	ton	28	0	0	to	30	0	0
Arsenate, 45%	ton	45	0	0	to	48	0	0
Bicarbonate	ton	10	10	0	to	11	0	0
Bichromate	lb.	0	0	6½	to	0	0	7
Bisulphite, 60-62%	ton	25	0	0	to	27	10	0
Chlorate	lb.	0	0	4¾	to	0	0	5
Caustic, 70%	ton	24	0	0	to	24	10	0
Caustic, 76%	ton	25	10	0	to	26	0	0
Hydrosulphite, powder, 85%	lb.	0	2	3	to	0	2	6
Hyposulphite, commercial	ton	15	0	0	to	16	0	0
Nitrite, 96-98%	ton	40	0	0	to	42	0	0
Phosphate, crystal	ton	23	10	0	to	25	10	0
Perborate	lb.	0	1	6	to	0	1	7
Prussiate	lb.	0	0	8½	to	0	0	9
Sulphide, crystals	ton	17	0	0	to	18	0	0
Sulphide, solid, 60-62%	ton	24	10	0	to	25	10	0
Sulphite, cryst	ton	15	0	0	to	16	0	0
Strontium carbonate	ton	80	0	0	to	85	10	0
Strontium Nitrate	ton	70	0	0	to	72	10	0
Strontium Sulphate, white	ton	7	10	0	to	8	10	0
Sulphur chloride	ton	41	0	0	to	42	0	0
Sulphur, Flowers	ton	13	0	0	to	14	0	0
Roll	ton	13	0	0	to	14	0	0
Tartar emetic	lb.	0	1	6	to	0	1	7
Tin perchloride, 33%	lb.	0	1	2	to	0	1	4
Tin perchloride, solid	lb.	0	1	5	to	0	1	7
Protochloride (tin crystals)	lb.	0	1	5	to	0	1	6
Zinc chloride, 102 Tw	ton	21	0	0	to	22	10	0
Chloride, solid, 96-98%	ton	50	0	0	to	55	0	0
Oxide, 99%	ton	40	0	0	to	42	0	0
Dust, 90%	ton	47	10	0	to	50	0	0
Sulphate	ton	21	10	0	to	22	10	0

Metals and Ferro Alloys

The following prices are furnished by Messrs. Miles, Mole & Co., Ltd., 101, Leadenhall Street, London, E.C.

	Per	£	s.	d.		£	s.	d.
Aluminium, 98-99%	ton	110	0	0	to	120	0	0
Antimony, English	ton	37	0	0	to	40	0	0
Copper, Best Selected	ton	68	0	0	to	69	0	0
Ferro-Chrome, 4-6%	ton	34	0	0	to	35	0	0
Ferro-Chrome Manganese, loose	ton	18	0	0	to	20	0	0
Silicon, 45-50%	ton	14	0	0	to	16	0	0
Tungsten, 75-80%	lb.	0	1	6	to	0	1	9
Lead Ingots	ton	25	0	0	to	26	0	0
Lead Sheets	ton	34	0	0	to	35	0	0
Nickel, 98-99%	ton	190	0	0	to	190	0	0
Tin, English	ton	154	0	0	to	155	0	0
Spelter	ton	26	0	0	to	27	0	0

Structural Steel

	Per	£	s.	d.		£	s.	d.
Angles and Tees	ton	13	0	0	to	14	0	0
Flats and Rounds	ton	13	0	0	to	14	0	0
Joists	ton	14	0	0	to	15	0	0
Plates	ton	14	0	0	to	15	0	0
Rails, heavy	ton	14	0	0	to	14	10	0
Sheets 24 Gauge	ton	16	10	0	to	17	0	0
Galvanised Corrd. Sheets	ton	20	0	0	to	21	0	0
Zinc Sheets	ton	34	0	0	to	35	0	0

French Potash

THERE has been no marked development in the trade during the past week. Prices have remained fairly firm, and importations of French kainit and sylvinite are being steadily disposed of. The buying influence of the fertiliser manufacturers is still being felt, as many of them have not yet obtained their full requirements. Sylvinite 20 per cent. seems to be the most attractive grade of potash salt at the present time, as the unit price is lower than any of the other grades on the market. The export trade in potash is fairly active.

Austrian Research on Colloid Chemistry

THE *Zeitschrift für Angewandte Chemie* announces the establishment in Vienna of a research institute for the investigation of problems relating to pure and applied colloid chemistry. Papers will be published by the institute, and eventually colloidal preparations will be made available to persons interested.

Central European Chemical Trade

FROM OUR OWN CORRESPONDENT.

Berlin, November 7, 1921.

CHEMICAL trade during October was to a certain extent restricted by a shortage of railway wagons. Benzol has been in very keen demand and the "Benzolverband" have been unable to satisfy all requirements. The wages of labourers in chemical works have been increased by 1·30 marks per hour, making an average increase of about 18 per cent. A considerable improvement was noticeable in pharmaceutical products, the demand from abroad, and from South America in particular, being steady throughout the month. Chemical preparations were in increasing demand from abroad. During the month trade in dyes fell short of the September level, and competition from Swiss dyes was apparent. Trade with Italy has been slight, and in Spain there has been strong competition from English, American and Swiss dye-making firms; similar competition was experienced in Portugal. There was a slight improvement in trade with England, but sales were not by any means brisk. Dyes have been sold in slightly increased quantities to Scandinavia and the Netherlands, but sales to the United States were insignificant. Some good orders were received from South America, and business with the Far East has also been satisfactory.

There was a considerable domestic demand for potash, and some export business was done on a satisfactory scale. Caustic potash and potassium carbonate were in good demand, and as a result stocks are low. Rock salt was asked for for home and export requirements. Stocks of carbonate of ammonia have been low, and there has been a strong demand for powdered and lump. White powdered arsenic has also been very scarce. Potassium metabisulphite continues to be in brisk demand and makers' prices have hardened further. Sodium chromate is scarce. There has been a brisk demand for sodium sulphide, but this also is very scarce. The price of corrosive sublimate has been erratic on account of strong demand, and acetanilide, which was rather scarce, has been in strong export demand.

Vienna, November 4, 1921.

The effect of the political upheaval in Hungary on the Austrian economic situation is reflected in prevailing market conditions. There has been some heavy speculative buying, and raw materials for soap manufacture have been in exceptionally strong demand. Acetic acid, 80 per cent., has been in constant demand and stocks are low. There is a fair export inquiry for soda crystals. Potassium chlorate is firm. Caustic soda remains in good demand.

An undertaking, which, it is thought, will make the Austrian chemical industry independent of several products hitherto imported, was started in October under the auspices of the Austrian Government. This concern, which is known as the Linzen Permanganatfabrik A. G., has a capital of a hundred million kronen, and is already producing potassium permanganate at a plant which commenced operations in June last. The company proposes to erect a sulphuric acid plant as well as a number of other factories for the manufacture of various chemical products.

The Nitrate Position

IN their monthly nitrate report Messrs. Henry Bath & Son state that the lower scale of prices for its European stocks fixed by the nitrate pool at the beginning of October created a revival of buying interest, but it was hardly expected that this action would meet with such immediate results. Up to the present sales at the new prices total over 180,000 tons. Some moderate advances in currency prices have been made from time to time, but the unfavourable tendency of the exchanges meantime has resulted in the sterling parity remaining practically unchanged. In the last week or two the volume of buying has contracted, but time is needed for inland dealers to distribute their purchases among the smaller buyers. The great bulk of the buying took place in France, where the speculative dealer plays a larger part than elsewhere, and those countries where nitrate goes more directly to consumers are only likely to buy largely when the actual season of consumption is nearer. The prospects of Chilean nitrate for Germany have not improved, in spite of a considerable rise lately in the price of German synthetic products, as the collapse of the German exchange makes importation more difficult than ever. Only thirty-four oficinas are now working in Chile, and last month's production is advised as about 73,000 tons.

Company News

CHLORIDE ELECTRICAL STORAGE.—A dividend of 5 per cent. actual on the ordinary shares, free of tax, is announced.

BRUNNER, MOND, & CO., LTD.—The directors have decided to declare an interim dividend on the ordinary shares for the half-year to September 30 at the rate of 5 per cent. per annum. Warrants will be posted on December 20 to holders on the register on November 11.

CAPE EXPLOSIVE WORKS, LTD.—The provisional scrip certificates to bearer of the 7½ per cent. first mortgage debenture stock may now be lodged at the company's office, to be exchanged for definitive stock certificates in the names of the holders. Scrip certificates may be presented any day (Saturdays excepted) between 11 and 2.

MANN & COOK (WEST AFRICA), LTD.—The accounts to March 31 last, covering a period of sixteen months, show a loss of £208,986. The position is attributed chiefly to the sudden trade depression, and to the failure of the vendor firm, Mann & Cook, in February last, when the indebtedness to the West African Company exceeded £60,000. (*See* THE CHEMICAL AGE, Vol. iv., pp. 282 and 303.)

BURMA CORPORATION, LTD.—The report to December 31 last states that operations resulted in a surplus of £455,516 (converted from rupees at the rate of 1s. 4d.). After providing for interest, depreciation, &c., and writing off preliminary expenses and cost of debenture issue, there remains £246,770, which it is proposed to carry forward. The adjourned annual general meeting will be held at 19, Merchant Street, Rangoon, on December 15, at 3 p.m.

NORTH BROKEN HILL, LTD.—The report for the year ended June 30 states that while the profit and loss account shows a profit of £8,128, the sum of £70,371 represents the receipts for concentrates produced in previous periods. The result for the past year is therefore a net loss of £62,242, without any provision having been made for depreciation, taxes, or royalty. The report states that, taking into consideration that, under the award of the special tribunal, wages have been increased and hours reduced, it is problematical whether the company can work profitably with lead at the present price. The assets of the company at June 30 last show a surplus over liabilities of £397,398.

SANTA CATALINA NITRATE CO.—The net profit for the year to June 30 last was £30,879 and £1,590 was brought in, making £32,469. The further dividend of 10 per cent. (2s. per share), already announced in THE CHEMICAL AGE, makes the total dividend for the year 20 per cent. The sum of £10,000 is placed to reserve, leaving to be carried forward, subject to Corporation profits tax, £6,669. Profit has been taken in the accounts on 143,243 quintals of nitrate sold against 318,757 quintals for the previous year. The manufacture of nitrate has been suspended since May 1 last. The annual meeting will be held at Winchester House on November 22 at 12.30.

LAGUNAS SYNDICATE.—The directors report a gross profit for the year to June 30 last of £75,919, an increase of £29,639 as compared with 1919-20. London expenses, taxes, debenture and other interest, and stoppage and reopening expenses, however, absorb £60,865, against only £29,677 in the previous year, so that the balance transferred to the sinking fund, in accordance with the resolution of the debenture-holders of December 14, 1914, is £1,530 smaller than a year ago at £15,053. It should be pointed out that the previous year's expenses included no charge for stoppage and reopening. Oficina North Lagunas was closed down at the end of March last, and South Lagunas at the end of May, and they will not be reopened until the present large stocks of nitrate in the consuming markets and in Chile have been materially reduced.

LONDON NITRATE CO.—For the year to June 30 last the profit after deducting depreciations was £100,894, increased by transfer fees to £100,914, and £13,176 was brought in, making £114,090. Office expenses in Liverpool and directors' fees absorbed £4,169 ; income tax and Corporation profits tax, £14,458 ; debenture interest, £8,990 ; bank charges, £10,164 ; stoppage of works, expenses, and repairs (balance), £3,723 ; one-fifth of the expenses of debenture issue, £856 ; and provision for stoppage of works expenses (1921-2), £36,000 ; leaving available, £35,730. From this a dividend of 1s. 6d. per share, free of tax, will be paid on December 1, leaving to be carried forward £20,730. Unsaleable stocks and congestion on the nitrate railway system were responsible for a loss of profit exceeding £35,000. The annual meeting will be held in the Common Hall, Hackins Hey, Liverpool, on November 24 at 2 p.m.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. No.
Spain ..	Chemical and pharmaceutical products	—
	Sulphate of ammonia	—
Toronto ..	Lead ; white metal alloys ..	—
Texas ..	Mining Chemicals..	417
Los Angeles ..	China clay ; ferro-alloys ; ferro-manganese ; ferro-silicon	414

Tariff Changes

BRITISH INDIA.—The Indian Lac Cess Act, 1921, provides that as from January 1, 1922, a Customs duty shall be levied on all lac and refuse lac produced in India and exported to any port beyond the limits of British India or to Aden. The duty, which is leviable until December 3, 1926, is at the rate of 4 annas per maund for lac, and 2 annas per maund in the case of refuse lac.

NEW ZEALAND.—In a revised Customs Tariff recently placed before the Dominion Parliament, the duties on goods of United Kingdom manufacture remain much as they were in the former Tariff. The duties have been increased in a very few cases, whilst in a number of cases they have been decreased. The preferential treatment of British goods is considerably extended.

TRINIDAD.—As from October 1 last, new regulations came into operation, to the effect that all goods entitled to preference under the British Preferential Tariff shall be accompanied, in the case of goods the growth, produce, or manufacture of the British Empire, by an invoice and certificate of origin and value. The invoice and combined certificate of value and origin so prescribed are identical with those contained in the report of the Imperial Customs Conference, 1921 (Cmd. 1231. Price 2d.).

AUSTRIA.—According to an Order of October 20 last, the import duties on, *inter alia*, precious metals, optical instruments, vinegar, fats and oils, perfumed alcoholic aromatic essences, articles of perfumery and cosmetics, fine soap and explosives of all kinds, including matches, are payable in gold.

Institution of Rubber Industry

Paper by Dr. H. P. Stevens

THE second London meeting of the Institution of Rubber Industry was held on Wednesday night at the Royal Society of Arts, John Street, Adelphi, Sir Frank Swettenham, G.C.M.G., presiding.

Dr. H. P. Stevens read a paper on the "Effect of Different Methods of Plantation Rubber Preparation on its Behaviour in the Factory." Although the title is identical with that of the paper read by Dr. Stevens at the Manchester meeting last week the substance was materially different.

Dr. Stevens dealt at some length with the question of standardisation, which he pointed out could only be satisfactorily carried out with liquid latex. He suggested that rubber manufacturers should make greater use of the new organic accelerators, which appeared to have been adopted to a much larger extent in the U.S.A. and Canada than in this country.

Dealing with the question of testing, Dr. Stevens said it was obviously impossible to test every sheet or even every case of rubber ; it must first be batched. If a machine were available for batching large quantities, a test vulcanisation on a sample would be practicable even for small firms.

An interesting and protracted discussion ensued in which Sir Frank Swettenham, Dr. Schidrowitz, Dr. Damiano and Messrs. Brooking, Sellers, Fordyce Jones, Rogers, Lidell, Tracker, Redfern, Cohen Standring, and Sivington took part.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

London Gazette

Partnerships Dissolved

BURN, Daniel Thomas, and O'DARE, Victor, as refiners of oil, in the city of Cardiff, under the style of Burn and O'Dare, by mutual consent as from May 9, 1921. Debts paid and received by D. T. Burn, who will carry on the business.

SNOW, Percy Henry, and BALDING, Walter Thomas, as oil and grease merchants, at 9, Brougham Street, Birmingham, Warwick, under the style of the English Oil and Grease Co., by mutual consent as from October 31, 1921. Debts received and paid by W. T. Balding, who will continue the business.

Bankruptcy Information

BOWMAN, Alexander, The Lowther Arcade, and 1, Rickergate, Carlisle, drug store proprietor. Receiving order, November 12, 1921. Debtor's petition.

Bankruptcy Petition

KIRK, Arthur, Nevills Cottage, Nevills Road, Letchworth, chemist and druggist, lately carrying on business at 72, Emanuel Road, Balham. A bankruptcy petition has been presented by Barclay & Sons, Ltd., of 95, Farringdon Street, London, and will be heard on November 24, at 10.30 a.m.

Company Winding Up Voluntarily

MOORE'S DRUG CO., LTD. C. L. Sixsmith, chartered accountant, of District Bank Chambers, Wood Street, Bolton, appointed liquidator. Meeting of creditors at District Bank Chambers, Bolton, on Tuesday, November 15, at 12 noon. Particulars of claims to the liquidator by November 28.

Liquidators' Notices

INECTO, LTD. Creditors are required, on or before December 31, 1921, to send particulars of their claims to H. J. de Courcy Moore, of 2, Gresham Buildings, Basinghall Street, E.C. 2, the liquidator of the company.

MASON & SONS, LTD. (In voluntary liquidation.) Particulars of claims by December 5 to the liquidator, Charles Stanley Wooldridge, of 25, Church Street, Dewsbury, solicitor.

County Court Judgments

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

ALEXANDER, L., 107, Fore Street, Saltash, drug store proprietor. £17 4s. 11d. September 30.

DRAKE KENDALL & CO., LTD., 29, Seymour Place, W. 1, veterinary chemists. £16 3s. 6d. October 3.

FITCH, W. B., 143, High Street, Rochester, chemist. £18 12s. 9d. September 26.

Bill of Sale

[*The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.*]

CRIMES, Robert Frederick, 48, Queen's Road, Norwich, analytical chemist. £50. November 14.

Receivership

LONDON COMPO CO., LTD. W. J. Cutbush, of 21, Hounslow Avenue, Hounslow, ceased to act as receiver or manager on September 29, 1921.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced since such date.*]

BRITISH CELLULOSE & CHEMICAL MANUFACTURING CO., LTD. (late British Cellulose & Chemical Manufacturing (Parent) Co., Ltd.), London, S.W. Registered November 1, £5,000 and £5,000 debentures part of £500,000; general charge. *Nil. December 23, 1920.

RAYMET & CO., LTD., London, W., manufacturing chemists. Registered November 2, £300 debentures part of £1,500; general charge. *£1,200. May 18, 1920.

New Companies Registered

The following list has been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C.2:—

ANGLO-UNITED OILFIELDS (1921), LTD., Portland House, 73, Basinghall Street, E.C. To acquire oil or other mines, mining rights, and oil bearing or metalliferous land, and turn same to account. Nominal capital, £500 in 1,000 shares of 10s. each. Minimum subscription, seven shares. Directors: to be appointed by subscribers. Qualification of directors, £250. Remuneration of directors, £250 each. Chairman, £350.

C. V., LTD., 20, Copthall Avenue, E.C. 2. Metallurgical chemists, assayers, refiners, &c. Nominal capital, £5,000 in 4,750 "A" shares and 250 "B" shares of £1 each. Directors: to be appointed by subscribers. Qualification of directors, £1.

G. B. DEVELOPMENT SYNDICATE, LTD., 6, Bury Court, St. Mary Axe, E.C. To enter into an agreement made between Henry Edwin Coley, 1, Paper Buildings, Temple, E.C., and Desmond Henry Dickson, 233, Elgin Avenue, W., to carry on and turn to account the invention mentioned in the said agreement. Nominal capital, £3,000 in 6,000 ordinary shares of 1s. each, and 2,700 preference shares of £1 each. Directors: R. M. McQueen, H. E. Coley. Qualification of directors, £50. Remuneration of directors, to be voted by company.

RIDING'S CASH DRUG STORES, LTD., 9, Wickham Lane, High Street, Plumstead. Chemist, druggist, &c. Nominal capital, £1,200 in 1,200 ordinary shares of £1 each. Directors: W. E. Hallock, (Mrs.) Emily A. Hallock.

Increase in Bankruptcy Cases

THE Board of Trade reports that for the year 1920 the total cases under the Bankruptcy and Deeds of Arrangement Acts were 2,016, an increase of 1,106 over 1919. The liabilities, as estimated by the debtors, aggregated £6,853,308, an increase of £4,479,510, and the assets similarly estimated were £3,048,993, an increase of £2,099,302, the estimated loss to creditors being £5,547,678, an increase of £3,575,786. It will be seen from the above figures that the number of insolvencies has increased to more than twice the number for 1919, and that the estimated liabilities and loss to creditors have increased in still greater proportion. During the current year there has been a further marked increase in the number of bankruptcies and deeds of arrangement, and on the basis of the figures recorded for the first six months of the year it may be anticipated that the total number of insolvencies in 1921 will be approximately equal to the number shown for 1914. The 1914 figures were 4,643 cases, with a loss to creditors of £8,155,673.

A Business Trip

It is reported that MR. CHARLES R. SARGENT, of C. R. Sargent & Co., dealers in chemicals, of Cleveland, Ohio, recently sailed from the United States on a business trip to the United Kingdom, France, Belgium, Denmark, and Germany.

TRADE GUIDE

CHEMICAL AGE

THE Trade Guide is a compact and handy form of reference to a representative list of firms engaged in various branches of the Industry. In most cases fuller particulars may be found by referring to the displayed advertisement elsewhere.

Acids

SULPHURIC
MURIATIC
DIPPING
BATTERY
NITRIC

OLEUM (all Strengths) and SALTCAKE

SPENCER CHAPMAN & MESSEL, Ltd.
36, Mark Lane, E.C.3.

Acid Resisting Metals

MONEL

Succeeds where other Metals fail.
Acid-resisting-Incorrodible
Bars, Rods, Sheets, Wire
Castings, Forgings

C. & J. WEIR LTD MONEL DEPT. CATHCART, GLASGOW.

Analytical Reagents

THE BRITISH DRUG HOUSES LIMITED LONDON BDH

Research Chemicals
THE BRITISH DRUG HOUSES, LTD.,
Graham St., City Rd.,
LONDON, N.

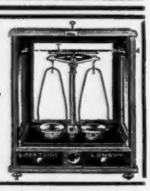
Asbestos

Pioneers of the World's Asbestos Industry

BELL'S UNITED ASBESTOS Co., Ltd.
Southwark Street, LONDON, S.E.1
(Established 1871)

Balances

Oertling
LONDON

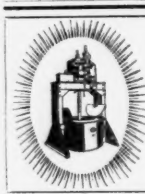


Chemical Plant

BENNETT SONS & SHEARS, LTD.
43, SHOE LANE.
LONDON, E.C.4.

Centrifuges
Autoclaves
Sterilizers, etc.
HARLES HEARSON & Co., Ltd.
WILLOW WALK, BERMONDSEY, S.E.

Chemical Plant (*Continued*)



CENTRIFUGES
Steam, Belt, Electrical, and Water Driven.
For every class of separation.
Write for new Catalogue No. 39.
T. Broadbent & Sons, Ltd.
Huddersfield.

Carbons

NORIT.
THE decolorising carbon and Refining Agent.
30 Times adsorptive capacity of bone char.
In five grades.
JOSEPH BAKER SONS & PERKINS Ltd.,
Head Offices: Kingsway House, Kingsway, W.C. 2
Telegrams: "Bakers, London."

Colours and Oxides

OXIDES CHROME COBALT
CADMIUM SULPHIDE,
SELENIUM,
ETC., ETC.
BLYTHE COLOURS
for POTTERY, GLASS, ENAMELLED IRON, AND CEMENT.
Est. 1870. CRESSWELL, STOKE-ON-TRENT, ENGLAND.

O'HARA & HOAR
Chemical Manufacturers
13, FISH STREET HILL, E.C.3
COLOURS, CARBON
PUMICE, CHALK.

Deodorising Compound

KUVROL REG.
Removes Objectionable Smells in White Spirit, Turpentine, Substitutes, Lubricating and Fuel Oils, Greases, Distempers, Glues, Etc.
CREPIN & DOUMIN, LTD.
15, COOPERS ROW, E.C.3.

Disinfectants

ALL GRADES, PERCENTAGES
AND CO-EFFICIENTS
ALSO
LIQUID SOAPS
W. GARDINER & CO.
83, Broad Street, Camlachie, Glasgow

Drums and Tins

JOHN FEAVER,
TOWER BRIDGE ROAD, S.E.1.
TINS for
PRESERVED PROVISIONS
and FOODSTUFFS.
CANS for VARNISH PAINT.
DRUMS & TAPERS for OILS, VARNISH.
Samples and Prices on Application.

Drying Machines

Drying Machines
Automatic & Continuous
Temperature under Perfect Control.
See Advert
RICHARD SIMON & SONS, LIMITED
BASFORD NOTTINGHAM

Evaporators

KESTNER PATENT
EVAPORATORS
ACID ELEVATORS
FANS
EXTRACTORS
CRYSTALLIZERS
Kestner Evaporator & Engineering Co. Ltd
5, Grosvenor Gardens, Westminster, S.W.1.

MULTIPLEX AND SIMPLEX FILM EVAPORATORS.
DISTILLING PLANT.
DRYING PLANT OIL HARDENING PLANT.
BLAIR CAMPBELL & McLEAN LTD GLASGOW
MAKERS OF ALL TYPES OF CHEMICAL PLANT.

Filterpresses

P.F.C.
PREMIER FILTERPRESS Co. LTD.
THE RESULT OF 60 YEARS EXPERIENCE
FINSBURY PAVEMENT HOUSE, LONDON, E.C.2